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ABSTRACT

This Teacher's Guide for first-grade mathematics is an outgrowth of an extended pilot project conducted nationwide between 1973 and 1976. The manner of presentation and the pedagogical ideas and tools are based on the works of Georges and Frederique Papy. They are recognized as having introduced colored arrow drawings ("papygrams") and models of our numeration system (the Papy "minicomputer") into the teaching of mathematics at the elementary and secondary level in Belgium. The CSMP curriculum follows the "spiral approach." The guide emphasizes that a topic may provide children with intuitive leaps which might help them acquire successive pieces of information. A list of demonstration manipulative materials available from CSMP is presented as well as individual materials for each student. Other materials not available from CSMP are announced in the text in advance of the lessons for which they are needed. This is part 1 of a two-part Teacher's Guide. Eighty lessons are included and each is titled, described, and summarized with a list of materials presented. Suggestions for organizing the program on a month-to-month basis for one semester reflects the experiences of the CSMP staff in developing the curriculum. Questions which are frequently asked about CSMP are answered in section two of the text. Worksheets for the students are included. (Author/SA)

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prehensive School Mathematics Program
CEMREL, Inc.
Final Experimental Version
1-27801

CSMP Mathematics for the First Grade Part I

Teacher's Guide

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Comprehensive School Mathematics Program

CSMP Mathematics
for the
First Grade
Part I

Teacher's Guide

CEMREL, Inc.

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PREFACE

CSMP Mathematics for the First Grade owes its existence to the coming together under the leadership of Burt Kaufman (CSMP Director) of a special group of people who have been concerned not only about the kind of mathematics that is being taught to children but also about the manner in which it is taught. This is even more important in the crucial early years of a child's life than in later years.

The CSMP first grade curriculum is in large part the outgrowth of a great deal of active involvement with children in ordinary classroom settings, and its present form was strongly influenced by information gathered from classes participating in an Extended Pilot Test conducted nationwide during 1973-77. But its manner of presentation and its main pedagogical ideas and tools, which stand out from all other curricula, are based on the pioneering works of Georges and Frédérique Papy, which we acknowledge here with deep gratitude.

Use of colored arrow diagrams[*] -

Georges Papy, Die Erste Elemente der Moderne Mathematik: Shriftenreihe zur Mathematik, Hefte 10-11 (Frankfurt and Hamburg: Otto Salle Verlag, 1962-63)

Mathématique Moderne, Vols. 1, 2, 3, 5, 6 (Brussels and Paris: Didier, 1964-1967)

Modern Mathematics 1, 2 (London: Collier-Macmillan Ltd., 1968)

Frédérique and Georges Papy, L'Enfant et les Graphes (Brussels, Montreal and Paris: Didier, 1968)

Graphs and the Child (Montreal: Algonquin, 1970)

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[*] In 1959, Georges Papy introduced colored arrow diagrams into the teaching of mathematics at the elementary and secondary school level, and for this reason, they are sometimes referred to as "papygrams" in his honor.

Les Enfants de 4 Ans et le Langage des Graphes (Paris: Classiques Hachette, 1973)

Origin of the Papy Minicomputer-

Georges Papy, Minicomputer (Brussels: IVAC, 1968) in collaboration with Frédérique Papy

Use of graphs and the Papy Minicomputer with young children-

Frédérique Papy, Les Enfants et la Mathématique[*], Vols. 1, 2, 3, 4 (Brussels, Montreal and Paris: Didier, 1970-1976)

Mathematics and the Child 1, (Montreal: Algonquin, 1971)

By making this wealth of experience available to CSMP, Frédérique and Georges Papy have made an invaluable contribution to the production of this program. It must also be acknowledged that the fundamental idea of presenting mathematics to children via "pedagogical situations" is due to the mathematician and psychologist Caleb Gattegno.

Various prototype versions of the program dating back to 1973 were due to the efforts of former CSMP staff members Martin Caplan, Lowell Carmony, Edward Esty, Edward Martin, Sol Pelavin, and Joan Wakefield.

The large amount of information gleaned, thanks to the interest and concern of many teachers, in the Extended Pilot Tests since 1973 led to the revision of the program that culminated in this final version. During the 1976-77 school year, this final version has been tried out by CSMP staff members Kevin Saunders and Janice Schweitzer in Jackson Park Elementary School, University City, Missouri. In this effort they received valued collaboration and support of first grade teachers Abbie Cobbs and Helen Longfield and the motivating responses of their students.

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[*] A series of books reporting on an experiment in teaching mathematics in grades 1 to 6 in Brussels, using the languages of strings, arrows and the Papy Minicomputer. The reports of the first four years have been published by Didier; the reports of the last two years exist only in manuscript.

NOTE ON AUTHORSHIP

This printed copy of the final experimental version of the CSMP First Grade Program is the result of the work of the following people:

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SECTION ONE

NOTES TO THE TEACHER

WELCOME

You are about to teach the CSMP First Grade Program, perhaps for the first time. We wish you success in your teaching and hope that both you and your students will enjoy the activities suggested in this teacher's guide. It is the purpose of these Notes to the Teacher to help you use this book effectively; to describe the materials and give suggestions for organizing the program; and to answer some frequently asked questions which may also be your questions about CSMP.

You will find, as you and your students take part in the activities during the year, that there is a definite CSMP viewpoint about elementary school mathematics, a viewpoint that we hope you will come to understand and share. We believe that learning takes place when children react to interesting situations (sometimes called a "pedagogy of situations"*), whether real life or fantasy, such as in stories or games. These situations involve children personally and allow arithmetic to take the form of "adventures in the world of numbers".

We believe that every child can and does learn something from each situation encountered in the program, sometimes suddenly and dramatically, sometimes latently. For this reason, CSMP teachers do not stick to one topic until it is "mastered". Indeed our experience indicates that true learning often stops when the purpose of a lesson is merely the mastery of a skill. Instead, we believe that learning is more a "spiral" process than a "straight line" process, that intuitive leaps play as big a role as acquiring small successive pieces of information, and that a variety of situations can provide the interrelated experiences through which we learn.

The Question and Answer section of these Notes to the Teacher gives more explanation of what we mean by a "pedagogy of situations" and a "spiral development", but you will probably learn their meanings only by experiencing them for yourself as you teach the curriculum. Meanwhile we assure you that a large number of CSMP teachers across the country have come to understand and embrace the CSMP style of teaching and learning and are greatly pleased with the results.*

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* This phrase is due to the mathematician and psychologist Caleb Gattegno.

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* See Evaluation Report 1-A-3 in the CSMP Evaluation Report Series, CEMREL, Inc., St. Louis, Missouri.

PROGRAM DESCRIPTION

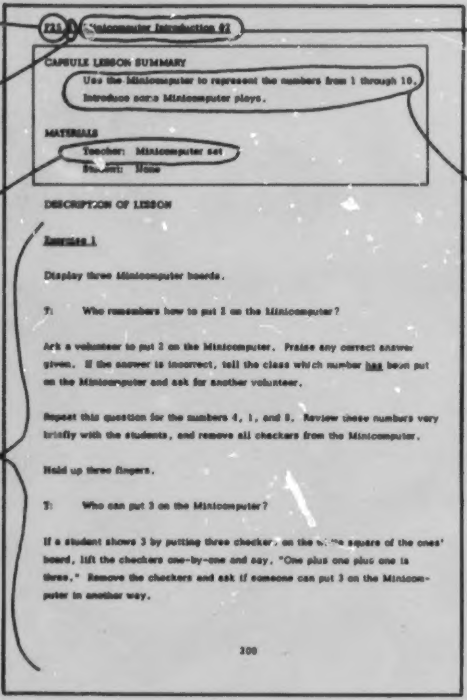
Since the learning process occurs through many interrelated experiences, we have developed this curriculum so that no single lesson is an end in itself. It is neither intended nor expected that every student will meet the full challenge of a particular situation in any given lesson. Furthermore, we have found that it is most effective to vary the situations from day to day rather than to continue one type of situation or topic until so-called mastery has occurred. This spiral development (see also Question 1 of Section Two) is reflected in the materials and scheduling of various topics in the curriculum. It is consistent with CSMP's pedagogy of situations since with such an approach, a child experiences each of several ideas a little at a time and then proceeds through increasing levels of sophistication as the situations become more challenging. We hope you will keep in mind the spiral approach as you teach the CSMP First Grade Program.

1. Description of Materials

a) Teacher's Guide

The Teacher's Guide to CSMP Mathematics for First Grade is bound in two volumes, Part I and Part II; each part contains enough lessons for approximately half a year's work. The lessons are described in Section Three in a day-by-day arrangement, the number of a lesson indicating when it will be taught. That is, you will start with the first lesson (F1) and progress day by day to the end of Part I. This schedule should take the class to about midway in the year at which time you will begin Part II, starting with the first lesson (S1), and proceed as far as possible through Part II during the school year.

Each lesson in the guide is presented in a format that includes its number (preceded by "F" for Part I or by "S" for Part II), title, summary, materials, and description. For example, the next page shows the first pages from the two lessons which together comprise the 25th mathematics lesson of the first semester.



F25.1 Minicomputer Introduction #2

CAPSULE LESSON SUMMARY

Use the Minicomputer to represent the numbers from 1 through 10. Introduce some Minicomputer plays.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

Exercise 1

Display three Minicomputer boards.

T: Who remembers how to put 2 on the Minicomputer?

Ask a volunteer to put 2 on the Minicomputer. Praise any correct answer given. If the answer is incorrect, tell the class which number has been put on the Minicomputer and ask for another volunteer.

Repeat this question for the numbers 4, 1, and 8. Review these numbers very briefly with the students, and remove all checkers from the Minicomputer.

Hold up three fingers.

T: Who can put 3 on the Minicomputer?

If a student shows 3 by putting three checkers on the white square of the ones' board, lift the checkers one-by-one and say, "One plus one plus one is three." Remove the checkers and ask if someone can put 3 on the Minicomputer in another way.

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25th lesson of the first semester

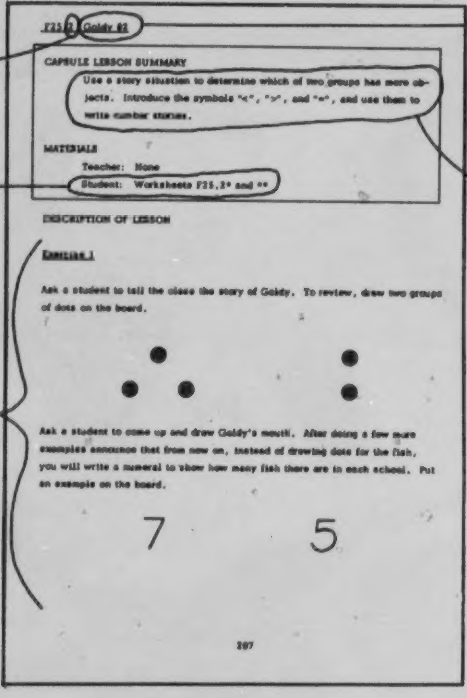
1st part of the lesson

Materials the teacher will use for demonstration

Detailed description of the lesson

Title-second lesson in a series of lessons introducing the Minicomputer

Short summary of the lesson



F25.2 Goldy #2

CAPSULE LESSON SUMMARY

Use a story situation to determine which of two groups has more objects. Introduce the symbols "<", ">", and "=", and use them to write number stories.

MATERIALS

Teacher: None
Student: Worksheets F25.2* and **

DESCRIPTION OF LESSON

Exercise 1

Ask a student to tell the class the story of Goldy. To review, draw two groups of dots on the board.

Ask a student to come up and draw Goldy's mouth. After doing a few more examples announce that from now on, instead of drawing dots for the fish, you will write a numeral to show how many fish there are in each school. Put an example on the board.

7 5

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2nd part of the lesson

Materials each student will need, usually for individual work

Detailed description of the lesson

Title-second lesson in a series of lessons about a fish named "Goldy"

Short summary of the lesson

The description of the lesson will include notes to the teacher, illustrations of diagrams the teacher puts on the board or otherwise displays for the class, examples of possible dialogue that could occur between teacher and students, and answer keys for worksheets or other independent work during the lesson. In this case, the answer keys for Worksheets F25.2* and ** are provided in reduced form at the end of the lesson description.

At the beginning of Section Three, there are some recommendations on being ready for the first day of class. Day Zero does not describe a lesson but rather provides information on what things CSMP assumes are available in your classroom; how to arrange materials so that they are accessible; and what visual aids could improve the learning atmosphere of your classroom.

Every tenth day (F10, F20, ...; S10, S20, ...) is described as an adjustment day, a time when you can stop and deal with the special needs of your class. (See Adjustment Days under SUGGESTIONS FOR ORGANIZING THE PROGRAM.) Adjustment days provide suggestions for dealing with a variety of student problems and needs. Also they include early warnings about materials which require some preparation and are needed in the next nine lessons.

b) Teacher's Materials

In addition to the teacher's guide, there are some demonstration manipulative materials you will need. The materials listed here are available from CSMP and should be in your classroom set of materials.

- Demonstration Minicomputer Kit
  (4 Magnetic Minicomputer boards ; 1 set of Magnetic checkers)
- A-Blocks String Game Kit
  (2 sets of A-Blocks ; 2 attribute posters ; 2 sets of string game cards ; magnetic material)
- Demonstration C-rods (needed for Part I only)
- Demonstration Numeral Cards
- 0-109 Numeral Chart
- Number Line
- First Grade Poster Set
  (Part I: posters #1, #2; Part II: posters #1, #2, #3, #4)
- Robot Walk Grid (needed for Part II only)

Other materials needed for individual lessons are mentioned under MATERIALS at the beginning of each lesson. Early Warnings announce these materials in advance of the lesson. Usually such materials (those not in your classroom set of materials) are readily available or can be easily prepared from usual classroom supplies.

c) Student's Materials

There are some individual materials that each student (each pair of students in the case of storybooks) will need. The materials listed here are available from CSMP and should be in your classroom set of materials.

- Worksheet Booklet for First Grade
  (one for Part I and one for Part II)
- A Parade of Problems Workbooks
  (Part I: #1; Part II: #2, #3)
- Storybooks from the STORIES BY FREDERIQUE Collection
  (Part I: "81 Roses", "One Out of Seven"
  Part II: "I Am a Very Happy Boy", "Little Dreamer",
  "The Weird Number 24")
- A-Blocks Set
- Individual Minicomputer Kit
  (2 sheets of Minicomputer boards; 1 sheet of checkers)
- Tangram Sheet
- Individual Number Line

Other materials needed for a lesson are mentioned under MATERIALS at the beginning of the lesson and, just as teacher's materials, Early Warnings announce these materials in advance of the lesson.

Some teachers find it convenient to provide each student with a sturdy cardboard box for story manipulative materials. Others find it more convenient to store all the materials of one kind together in a container of appropriate size and to distribute these materials to the students as they are needed. In any case, you should probably keep the worksheet booklets, workbooks, and storybooks in your storage area and distribute them as called for in the lessons.

Some storybooks in the STORIES BY FREDERIQUE collection are provided in your classroom set of materials although they are not used in any lessons during the First Grade Program. There are two copies of each such storybook; we suggest that these be available in a reading corner for students to read whenever they wish.

2. Role and Use of Worksheets, Workbooks, and Storybooks

a) Worksheets

With some lessons there are worksheets for independent work. Worksheets are designated with numbers corresponding to the lessons with which they are used and with stars indicating the order in which they are to be done by the students. The stars also suggest an increasing level of difficulty and thereby provide for various abilities of students. IMPORTANT: It is imperative that you do not insist on every student finishing every worksheet before going on to the next lesson. The worksheets are designed to accommodate differences in students interests and abilities. Some students will finish more worksheets than others during the allotted time. But the same ideas will emerge in new settings in later lessons, so that students will have other opportunities to work independently on the same topics.

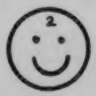
b) Workbooks

The CSMP First Grade Program includes three workbooks titled "A Parade of Problems" (#1 in Part I; #2 and #3 in Part II). Each is a 32 page booklet that reviews problems which have been encountered up to that point in the curriculum. Two lessons are scheduled for each workbook, and we suggest that all students be directed to start at the beginning of the booklet and work independently through as many pages as they can during the two scheduled periods.

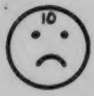
Ordinarily the first ten pages of a workbook are easy enough to guarantee some success for all the students; the next ten to twelve pages are average level difficulty; and the remaining pages are more difficult, often challenging even your best students. We would estimate that about two-thirds of your students should correctly finish the first ten pages during the two scheduled lessons, one-third should finish the first twenty pages, and a few might finish all or most of the pages. Of course, these proportions will vary from class to class.

Two full class periods are devoted to each workbook. At the end of the first period you should collect the workbooks and check some or all the pages completed. Then, when you return the workbooks at the beginning of the next workbook period, the students can correct their mistakes before going on with new problems.

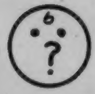
Notice that the cover page of each workbook includes spaces for marking your evaluation of the work on each page. One way to do this is to use these symbols:



meaning "well done" or "correct"

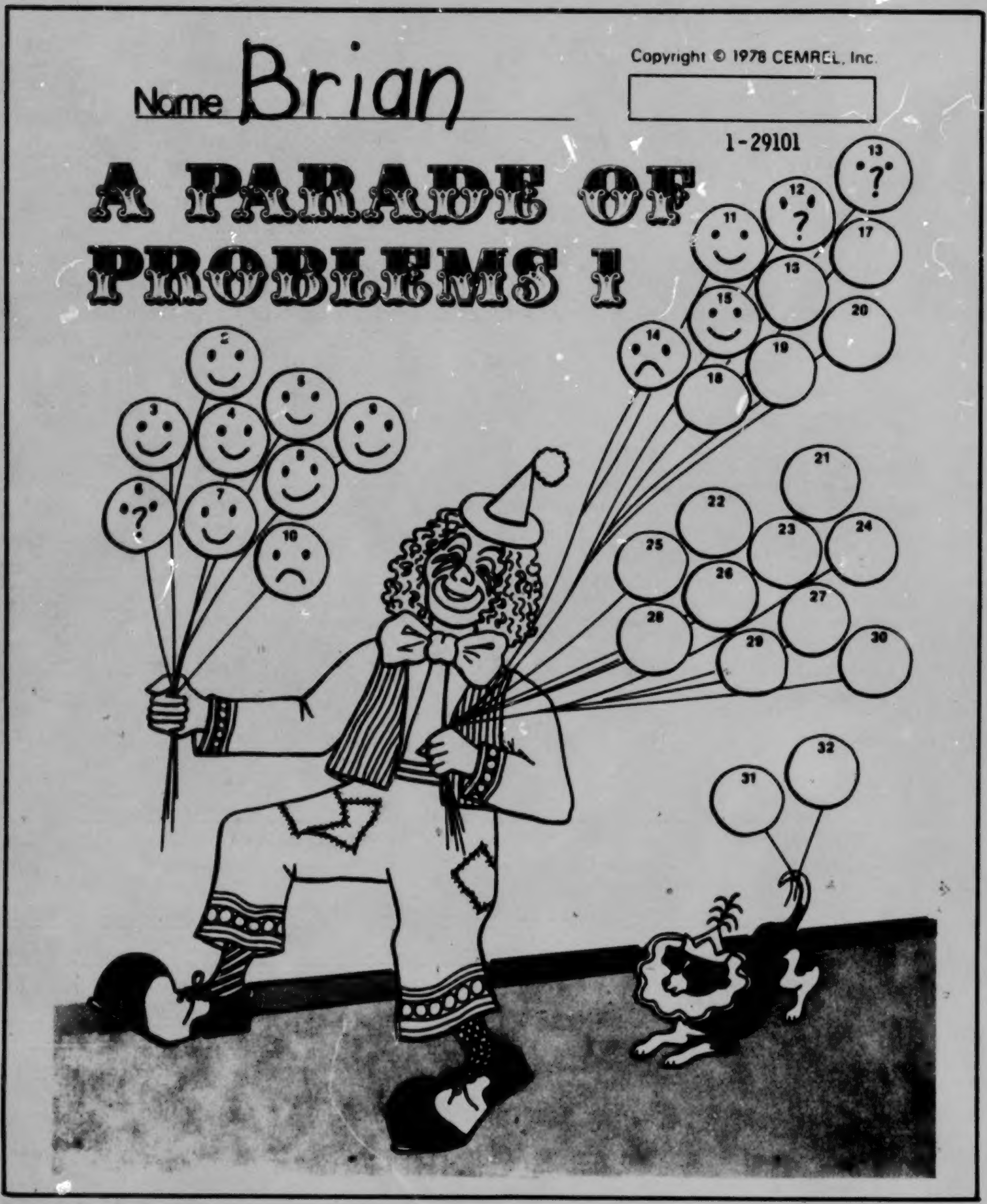


meaning "something wrong, try again"



meaning "did you forget this problem"
or "do you need a hint?"

The next page shows the front cover of one student's "A Parade of Problems #1" workbook after it has been checked. IMPORTANT: Again we ask you not to require or even encourage every student to finish every problem in a workbook. If, at the end of the two lessons allotted for a workbook, some students have not completed as much of the workbook as you expect they are capable of, you might suggest they spend some extra time on it during the next adjustment day class. It would not be useful to demand completion or "mastery" before permitting work to begin on the next workbook series.



Name Brian

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A PARADE OF PROBLEMS 1

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NOTE: This is the way Brian's workbook was returned to him at the beginning of the second lesson devoted to this workbook. The blank circles 16 - 32 indicate that he had not yet worked on these pages. Before Brian goes ahead to page 16 during the second lesson, he should correct mistakes on pages 10 and 14 and finish the work on pages 6, 12, and 13.

After the second workbook period, and after you have checked the results, you might want to send workbooks home with students. This could be one way to keep parents informed of their children's progress.

c) Storybooks

Presently, there are twenty-four storybooks for young readers in the collection STORIES BY FREDERIQUE. Each story is presented in a colorful newsprint booklet and can be used for individual or collective reading at school or at home. The stories are independent of each other and for the most part need no teacher explanations. The titles of the books in the collection and the intended age range for each story are:

Ages 5 to 8

- THE PLAYFUL NUMBERS
- 81 ROSES
- I AM A VERY HAPPY BOY
- ONE OUT OF SEVEN
- THE HAPPY PUPPET
- TWO BY TWO
- THE LITTLE DREAMER
- THE LITTLE DONKEY
- THE MAGIC BOX
- THE BABY IS BORN
- THE WEIRD STORY OF 24
- THE OLD SHOEMAKER

Ages 8 to 12

- WHERE'S MY NOSE?
- SINGING FRIENDS
- DANCING FRIENDS
- THE LIVING LINES
- I AM NOT MY NAME
- NABU WINS AN AWARD
- THE SQUARE TRAP
- SUMMER SCHOOL IN THE OLD DAYS

Ages 10 to 14

- THE HIDDEN TREASURE
- A VERY STRANGE NEIGHBORHOOD
- ELECTION IN THE NUMBER WORLD
- A VALENTINE MYSTERY

Among the twelve storybooks intended for children ages 5 to 8, five are used as the basis of lessons in the CSMP First Grade Program (two in Part I and three in Part II). Young people can become personally involved in these stories; there are questions to answer, pictures to relate to the story, information to be found in the pictures, and new adventures to invent for the characters in the stories. They find that in the world of numbers there are emotions to be expressed and aesthetic senses to be developed just as in the world of people.

At the first grade level, an important part of the lessons using storybooks is relating a picture to a story. Then the nonverbal languages in the pictures (arrows and strings) communicate other exciting information to the reader. Your students will probably want to reread (or just look at) the storybooks many times after they have used them for lessons. Other storybooks (two additional titles from the STORIES BY FREDERIQUE collection have been included in your classroom set of materials although they are not used with lessons) could be made available for individual reading during free time.

SUGGESTIONS FOR ORGANIZING THE PROGRAM

1. Schedule of Lessons

The design and schedule of the lessons in this guide should be regarded as suggestions; they reflect the experiences of the CSMP staff in developing the curriculum. It is difficult for curriculum developers to predict which topics will be easy for your students and which lessons will require more or less time for your particular class. Only you will be able to judge that as you teach the lessons. Thus the program is not meant to be a rigid sequence of lessons to be followed exactly, but only as a suggested guide.

The master schedule for the first semester, Part I, is shown on pages 20 and 21. It was constructed for a hypothetical first grade class of average ability for a half year of 80 days, with one class period a day of 30 to 45 minutes duration. A semester ordinarily includes 90 teaching days, but we expect that many days are usually taken up by activities such as parent-teacher conferences, assemblies, field trips, or by snow days, etc. Ten unscheduled days during the semester should provide for such days and allow you some freedom in planning mathematics lessons. You should adjust this schedule to the abilities, maturity and interests of your own students, as well as to the length of your school year and the length of time each day that you devote to mathematics.

Each block in the schedule represents one class period. It may be, however, that you will spend more than one period on a few lessons. A lesson that is much too long might be finished the next day. But you probably should not prolong a lesson which is just a bit too long. Remember that it is better to stop a lesson when student interest is high and that the topic will reappear on the spiral. If you find that you and your class are more comfortable with a slower schedule, it is suggested that you still follow the suggested order of the lessons.

3. Adjustment Days

Every tenth day of the schedule there appears an "adjustment day", a day on which we have not scheduled one of the regular lessons so that you will have an opportunity to meet special needs of your own class.

For example, children entering first grade vary widely in their number readiness. You will be aware of these individual needs, and the adjustment days can be used to help students who lack certain readiness skills assumed by the CSMP curriculum; for example, students who cannot recite the numerals in order from "1" to "20", or cannot count a small number of objects, or who cannot recognize the numerals from "0" to "10". Suggestions for activities to use with these students are included in the sections of the guide devoted to adjustment days.

As another example, you may wish to use some portions of adjustment days to repeat certain lessons either with a small group or the entire class. There are many lessons which can easily be varied by changing the story lines or the numbers in the stories of these lessons. Such repetition of lessons is encouraged as an adjustment day activity.

At the end of these sections you will be given early warnings about any of the lessons coming up during the next nine days requiring special materials you need to prepare or obtain.

Of course, you might not need an adjustment day when one is scheduled. When you feel there is no need for an adjustment day, simply go on to the next lesson.

3. Mental Arithmetic Supplementary Activities

Throughout the lessons there are many activities that children enjoy doing over and over in a variety of forms. For example, the string games and the number line games (to mention only two such activities) can be played whenever an extra time period is available. Of particular importance and enjoyment are the activities dealing with mental arithmetic; fully one-third of the lessons involve such activities. Teachers can invent clever variations of these mental arithmetic activities to be used often during a school day as adjuncts to the natural school routines. Some of the most obvious are: checking class attendance (How many present? How many should be here? How many absent?); the opening exercises (What day of the month is it? How many days in this month? How many days left?); distributing materials (How many students? Two pencils for each. How many pencils?).

Some teachers might want to do some supplementary drill work on writing numerals or on basic number facts. We would suggest that the drill be kept to a minimum so as not to suggest to children that arithmetic is a chore.

Some classes may finish Part I before the end of the first semester. In that case, they should continue immediately with Part II. Classes that finish the entire first grade curriculum early (possibly not needing all the adjustment days), could spend the remaining days playing their favorite games, doing more addition and subtraction activities on the Minicomputer, or repeating (perhaps with some slight modification) some of their favorite lessons.

SUGGESTED SCHEDULE OF LESSONS

Master Schedule for the CSMP First Grade Program, Part I

FIRST MONTH	F1 p. 52 Cats and Mice	F2.1 p. 58 Numerical Activity #1 F2.2 p. 61 Bedtime for Birds	F3 p. 67 Numerical Activity #2	F4 p. 71 One to One Correspondence	F5 p. 78 Numerical Activity #3
	F6.1 p. 84 Walks on One-Way Roads #1 F6.2 p. 87 Numeral Writing Worksheets	F7.1 p. 89 Staircase Review F7.2 p. 91 The Little School	F8 p. 96 Addition Story #1	F9 p. 101 Left Shoe - Right Shoe	F10 p. 107 ADJUSTMENT DAY #1
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SECTION TWO

QUESTIONS AND ANSWERS ABOUT CSMP

As you teach the CSMP curriculum or even as you prepare to teach it, there will be some basic questions that come to your mind. Very likely they are the same kinds of questions that parents and supervisors will ask about a curriculum that appears to be different from the traditional program. Perhaps some of the questions that concern you are answered here.

1. Q: WHAT IS THE SPIRAL APPROACH? HOW DOES IT WORK?

A: We learn through many interrelated experiences. But no experience, particularly a first grade math lesson, is an end in itself. With this in mind, CSMP introduces an idea in one lesson, then another in the next lesson, then another. Later the first idea reappears in a slightly new setting or in a slightly expanded version; then a second topic reappears; and so on. Each of the many times that a particular idea or area of study reappears, it is treated in a different manner and at a slightly higher level than the last time. This is called a spiral development.

Children learn at different times and at different rates. Only part of the learning of a given topic actually takes place during a lesson on the topic. In between the times when the topic occurs on the learning "spiral", the child is mentally digesting the idea, sometimes consciously, usually unconsciously. In this way the spiral development gives each student a new chance to "catch on" at each stage.

We find it highly effective to follow this kind of development rather than continuing on and on with a topic until so called "mastery" has occurred.

Sticking with the spiral idea requires an act of faith on your part, particularly if you have been used to teaching a given topic until you are satisfied that all (or at least most) of the class knows it "cold". Belief in the spiral approach implies that some lessons may be stopped before some (or even a majority of) children appear to have caught on, or in a lesson involving worksheets or workbooks, before everyone has successfully completed all the pages. It involves knowing that the topic will reappear again and again, and that varying degrees of understanding will come at varying rates and times. It entails a belief that an idea planted now may not sprout until much later, and that it is best not to force its development. All our experience to date (including five years of extended pilot testing of the curriculum) indicates that this approach really works.

2. Q: I UNDERSTAND HOW THE SPIRAL DEVELOPMENT WORKS, BUT HOW CAN I ASSESS MY STUDENTS' PROGRESS UNDER SUCH AN APPROACH?

A: We don't believe it is desirable or reasonable to try to evaluate student mastery of skills from day to day or even from week to week. On the other hand, teachers, parents and the children themselves benefit by some monitoring of the students' progress and involvement with the activities. Most teachers have their own methods for doing this with which they are comfortable, and we suggest that you continue to use your own monitoring methods. You will find group interaction in the lessons and the individual responses on worksheets and workbooks provide much valuable information. The spiral development in fact may help rather than hinder your long term assessment of students' progress.

3. Q: ARE THERE GOALS FOR EACH LESSON?

A: At the beginning of each lesson plan there is a CAPSULE LESSON SUMMARY, which describes briefly the activities and experiences included in the lesson. Indirectly these summaries suggest goals but, of course, the goals of the curriculum spread over whole series of lessons and cannot be broken into specific goals for individual lessons. Though we expect you will easily see the direction and intent of the lessons, we decline to predict for any one lesson what will happen in terms of student learning.

4. Q: SHOULD I SUPPLEMENT THE PROGRAM WITH MORE PRACTICE IN NUMBER FACTS?

A: There is a surprising amount of such practice throughout the program. It is implicit in the activities and is not in the form of practice for its own sake. If you still feel it is necessary to give supplementary practice, we suggest that you keep repetitive drill to a minimum so as not to endanger the students' interest in numerical situations.

5. Q: IS THE CSMP KINDERGARTEN PROGRAM A PREREQUISITE FOR THE FIRST GRADE PROGRAM?

A: No. Although children with prior experience in the CSMP Kindergarten Program will have a short term advantage, we have found that such experience is not necessary. The lessons in the CSMP First Grade Program are designed for children with no previous school experience; if they have prior experience, they will initially move faster and more easily through the early lessons, but soon the advantage fades as the rest of the class gains from their experience.

6. Q: WHAT PROVISION DOES THE PROGRAM MAKE FOR STUDENTS WHO ENTER FIRST GRADE WITH POOR NUMBER READINESS?

A: Every tenth day of the schedule is set aside to address problems of this kind. (See SUGGESTIONS FOR ORGANIZING THE PROGRAM - ADJUSTMENT DAYS in Section One.) The suggestions for adjustment days include ideas for dealing with particular needs of certain children, such as a need to be able to count a small number of objects, or to be able to recognize the numerals from "0" to "10", etc.

7. Q: HOW DO I HANDLE STUDENTS WHO HAVE AN EXTENDED ABSENCE OR STUDENTS (NEW TO CSMP) WHO TRANSFER INTO MY CLASS DURING THE YEAR?

A: The spiral approach allows a student to miss one or two weeks of school without much "catch up" work needed. When the student returns, either you or classmates can help with any material that is deemed necessary.

If several months of classes have been missed, you might need to treat the student as you would a transfer student new to CSMP. Give the student a little extra attention during a lesson especially when the questions are review for most of the class.

In most cases, the differences between new and veteran students tend to fade rather quickly. However, if it is late in the year, one exception might be in lessons involving the Minicomputer. Veteran students who are unusually adept with the Minicomputer very often are good tutors for the transfer students in the use of this abacus.

It is probably best not to send worksheets and/or workbooks home to a child; without participating in the collective lessons that introduce the worksheets and workbooks, it would be very difficult for the student to proceed.

8. Q: WHAT PROVISIONS ARE MADE FOR THE VARIETY OF ABILITIES IN A USUAL CLASS?

A: Every lesson includes something for all students; there are opportunities for the slowest students to participate in a meaningful way, and there are challenges for even the very brightest students. This means that you should not exclude any students from a full group lesson. At the same time, you should not expect every student to understand everything during the course of the lesson. Furthermore, with the spiral development many situations are open-ended and allow students to experience them at levels as high as they are capable.

Evaluation has shown that students traditionally labeled "slow" are doing better in CSMP classes than in non-CSMP classes. We believe this is due to the spiral development, to full group work on mathematical activities, and to the presence in the CSMP curriculum of certain non-numerical activities in which many supposedly "slow" students can excel.

Additionally, CSMP provides for a variety of ability levels in the student materials. Worksheets and workbooks offer problems in a range from very easy to quite challenging. Indeed, some of the "higher starred" worksheets and pages toward the ends of workbooks may be accessible only to your very best students.

In an extreme case, you might seriously consider the possibility of arranging for exceptionally bright students to take their math course with a CSMP second grade class.

9. Q: WHY ARE THERE NO LESSONS ON TELLING TIME; OR ON MEASURING WEIGHT, VOLUME AND CAPACITY; OR ON THE ENGLISH SYSTEM OF MEASUREMENTS; OR ON OUR MONETARY SYSTEM?

A: Since there are many excellent materials available to help you teach children to tell time, there is no need for us to duplicate them in this guide. Present your usual lessons on this topic. Furthermore, we feel that instruction in telling time belongs more naturally as a part of a language program than of a mathematics program.

Measurement of length and area is begun in the CSMP First Grade Program, but we do not believe that measures of volume, weight, capacity, or temperature are appropriate topics for first grade. Development of these measures are taken up at later CSMP grade levels.

In the near future the United States will have adopted the metric system. Our students will have to live in this new world. We want to give them a good start by using metric units whenever there is cause to engage in measurement activities. In the first grade, we limit this to measuring length in meters and, for the time being, avoid English units (inches, feet, yards, etc.). It would be confusing if your students had to deal with both systems at this beginning stage.

Although we do not deal with money as a separate topic in the first grade, we do pose situations in which students count combinations of coins that total a certain amount, thereby gaining experience with money and its values.

10. Q: I PREFER TEACHING SMALL GROUPS, BUT MOST OF THE LESSONS SEEM TO BE AIMED AT THE WHOLE GROUP. WHAT DO YOU SUGGEST?

A: If your school routine allows you to teach each lesson twice, once to each half of your class, that would be an alternative way to proceed. But if you do this, it might be wise to vary the composition of the groups from day to day so that you are not tempted to group your children according to your perception of their ability. Otherwise you would guarantee that half your students would not have as rich an experience as the other half, through no fault of their own. The purpose of the full group experiences is to allow interaction among all the children in every situation posed in the lessons. Students learn quite a bit from each others' reactions. You will be surprised to find that in some situations the key responses are made by children you had labeled "slow". We feel the spiral approach has maximum potential in full group teaching.

The above response might give the impression that CSMP teaching takes place only in full group settings. This is not the case. There is much time devoted to individual student work on worksheets and workbooks, and there are various games to be played. We also encourage you to arrange small group sessions whenever you have time, particularly with your slower students. Small group activities could supplement the full group lessons, but should not replace them.

11. Q: WHAT PROVISION IS MADE FOR INDIVIDUALIZATION IN THE CSMP PROGRAM?

A: In many of the first grade lessons there are worksheets to be done individually by the students. Sometimes the worksheets are done at the beginning of a lesson, followed by a full group discussion of them. But ordinarily a topic is first developed in a full group setting, followed by individual student work on related worksheets. If "individualization" means a procedure for allowing students to work along at their individual rates and levels, then the worksheets (and also the workbooks, discussed below) do provide for (partial) individualization. A series of worksheets for a given lesson offers a whole spectrum of levels from very simple to quite challenging. Students all start with the first worksheet (one-star) and proceed at their own pace and level as far as they are capable. The spiral approach accommodates this kind of individual work in the same manner as the full group work; that is, no worksheet is a prerequisite for the content of any succeeding lesson.

Six lessons during the school year are devoted to the three first grade workbooks. (See the two lessons in Part I and four lessons in Part II titled "A Parade of Problems".) Each workbook is also designed to move through a spectrum of levels of difficulty. We believe that the worksheets and workbooks realize the best sense of "individualization".

12. Q: WHY IS A "DIALOGUE" STYLE USED AS A FORMAT FOR THE LESSON PLANS? ARE TEACHERS EXPECTED TO FOLLOW THIS DIALOGUE EXACTLY?

A: Most of the lessons are written in considerable detail; step by step descriptions are frequently given, together with suggestions for the exact words a teacher might use (in the form of a possible dialogue between teacher and students). These details are given only for the teachers who feel the need for them. You should never feel obligated to follow any lesson word for word as it is written in the guide. By the same token, you should never insist that your students give the same responses as those given in the imaginary dialogues. Use your own creativity in drawing out student responses as the situations suggest. Read the lesson plans very carefully beforehand to get an idea how the lessons are expected to proceed.

13. Q: HOW OFTEN AND HOW LONG SHOULD I TEACH MATHEMATICS IN FIRST GRADE?

A: The CSMP schedule suggests that you teach mathematics (usually) five days a week for 30 to 45 minutes each day. On some days of the schedule there are two short lessons scheduled. These can be taught during one time interval or at different times in the day.

14. Q: IS IT NECESSARY TO FOLLOW THE SUGGESTED SCHEDULE EXACTLY?

A: This program is not meant to be a static sequence of exercises to be followed rigidly. The lessons in this guide are only suggestions based on our own experience teaching the materials. If this will be the first time you are teaching the program and you would like specific suggestions for organizing the lessons, we offer some guidelines and a suggested schedule of lessons. You may wish to follow it at the beginning of the school year and then deviate from it as the needs of your students may dictate.

Exercise your own professional judgment in deciding when to stop a particular lesson. It is better to stop a lesson when student interest is high than to teach so methodically that everyone in the class understands everything, but is completely bored. In order to be successful with this curriculum, you should adjust the schedule to the ability, maturity, and interests of your class.

15.Q: WHAT IS THE ROLE OF STORYBOOKS IN THE CURRICULUM?

A: The storybooks in the collection STORIES BY FREDERIQUE include 24 stories for young children, presented in colorful newsprint booklets for children. Five stories from this collection are used for lessons in the First Grade Program (two in Part I and three in Part II), with 15 copies of each storybook provided in a classroom set of materials. (If your school can afford it, we recommend that you order enough extra copies to provide one for each child.) Each of the stories is portrayed by the mathematical languages of dots, arrows, and strings which reinforce the ideas of the stories. Young readers can become personally involved in the stories; there are questions to answer, pictures to relate to the story, and new adventures to invent for the characters of the stories. They find that emotions and aesthetic senses are involved in the world of mathematics just as in the world of people.

16.Q: FOR WHAT SORT OF STUDENT IS THE CSMP ELEMENTARY CURRICULUM DESIGNED?

A: It is designed for all children in the schools. Each learning situation is designed to involve all students at their own levels in such a way that the slowest can succeed in dealing with some aspects of the situation that challenge them. In fact, it has been found that such a "pedagogy of situations" (see Question 17) is particularly effective with the so-called "slow" learners, and recent work suggests it might be be effective also with educable mentally handicapped children.

17.Q: BRIEFLY, HOW DOES CSMP DIFFER FROM A TRADITIONAL MATHEMATICS CURRICULUM?

A: The core content of CSMP is not revolutionary. The program aims to inculcate ideas and facts that have always been considered important in mathematics. The major differences are in method. Traditional teaching takes pride in disciplining students to be submitted to the usual paper and pencil algorithms. CSMP students are involved as well in many other real mathematical activities, with understanding at their level.

A pedagogy of situations is employed to permit children to participate in the learning process. The students are faced with situations and are led by their reactions to important ideas in mathematics. Thereby, students begin to mathematize situations, a process which is of fundamental importance whenever mathematics is applied.

CSMP also makes use of a spiral approach rather than the mastery approach found in most mathematics curricula. (See Question 1)

18.Q: ISN'T THIS THE "NEW MATH"?

A: There is a current popular belief that all school mathematics today is either "new math" or "old math". Neither of these labels is well defined. "New math" usually denotes the programs that heavily emphasize the teaching of sets; introduce technical mathematical language for concepts such as "commutativity", "associativity", "distributivity", and so on; and that teach "concepts" before "skills". The "old math" refers to programs of the "good old days": memorization of the multiplication tables and complete emphasis on paper and pencil drill in calculations.

The CSMP curriculum is definitely not the "new math" nor the "old" by any definition. It uses no technical language, yet achieves the understandings sought by the "new math". It uses no repetitive drills, yet elicits the ability to calculate stressed by the "old". But these achievements are just by-products of a more pervasive goal: to help children use their curiosity, their intuition, their powers to reasoning to formulate and think about interesting problems and situations.

19.Q: ARE ALL THE TOPICS IN THE CSMP CURRICULUM REALLY MATHEMATICS?

A: Yes. Mathematics is much more than calculation with numbers, and its methods include more than paper and pencil algorithms. The CSMP curriculum is filled with experiences that directly and indirectly relate to a wide world of numbers, their interrelationships and the kinds of logical reasoning about these relationships that make mathematics an activity of interest and concern.

20.Q: WHY USE THE LANGUAGES OF STRINGS, ARROWS, AND THE PAPY MINICOMPUTER?

A: It is surprising that the language of strings was not used earlier and more extensively in the teaching of mathematics. Mathematicians have used strings for a very long time; they support classification notions so fundamental and natural that they go back to Aristotle. The scope of the string diagrams is broader than mathematics, the string diagram being a marvelous instrument for logical thinking. String diagrams permit the understanding of a situation at a glance; they generate math concepts and ideas through child-related discussion.

Arrow diagrams are probably the most important teaching aid in the CSMP curriculum. They are used everywhere in our daily lives: signals, advertisements, directions, and so on. Why not use them in teaching mathematics? Arrows are a pictorial way to represent relations. Relations have always been important in mathematics, but in the past seemed to be something rather abstract, elusive, and mysterious. With arrows they become vivid, concrete, and easy to understand.

The Minicomputer allows very young children to become familiar with numbers and operations on them (especially large numbers and the more difficult calculations) before they are able to work with them on paper. Later the Minicomputer is used as a vehicle for posing situations involving mental arithmetic and for examining the workings of the arithmetic operations. It provides the experience necessary so that, rather than memorizing an algorithm and applying it to situations, the situations give rise to the algorithm.

21.Q: IF THE STUDENTS USE THE MINICOMPUTER, WILL THEY BE ABLE TO CALCULATE WITHOUT IT?

A: This question suggests that the only purpose of the Minicomputer in the CSMP curriculum is to perform calculations. To be sure, the Minicomputer does enable very young children to deal with "large" numbers and perform relatively difficult calculations long before they know the paper and pencil algorithms for the calculations. But very soon these experiences with the Minicomputer suggest how the paper and pencil algorithms come about, and from that moment the Minicomputer is no longer regarded as a calculating device. Later, usually in the second grade and for the remainder of the K-6 curriculum, the Minicomputer assumes its primary roles: as a source of very interesting problems and games, as an effective vehicle for stimulating mental arithmetic, as a teaching device for introducing more advanced topics such as the negative numbers and the decimal numbers, and, in general, as an alternative to the usual representation of numbers.

22.Q: WHY IS THERE A LACK OF DRILL AND LITTLE EMPHASIS ON "SKILLS"?

A: CSMP believes that training for rote skill should never precede understanding. The avowed purpose of drill in arithmetic is to acquire the "skills", that is, the skills of calculation. Certain numerical skills are essential, but unfortunately for school children, the usual drill techniques for acquiring them are dull, stultifying and sometimes even counterproductive. The CSMP curriculum appears to place little emphasis on "skills" because it does not resort to drill. But as a matter of fact, the essential skills of both mental and written calculation are learned almost inadvertantly in response to the many situations where the ability to calculate is needed in order to respond to the situation: to win the number game, to identify the secret number of the detective story, or to build a number road. Always, calculation is considered as a tool for doing interesting things, rather than a chore done for its own sake.

23.Q: HOW DO STUDENTS LEARN TO USE MATHEMATICS IN PRACTICAL SITUATIONS?

A: For students of elementary school age, a situation that intrigues them and catches their imagination or their curiosity will certainly motivate them to learn whatever is necessary in order to deal with the situation. But situations that adults consider "practical" very often are outside the realm of interest of school children and do not provide motivation for learning. CSMP has found that students will indeed learn to use mathematics in situations they consider worthy of their attention. As they approach adulthood they will soon consider "practical" situations to be most worthy of their attention, but in the meanwhile, they are more interested in games, fantasy, puzzles, stories, and so on.

24.Q: HOW DO CSMP STUDENTS DO ON STANDARDIZED TESTS?

A: While CSMP disagrees with the philosophy underlying standardized testing, test results are available to us from several sources. The results indicate that CSMP classes generally do as well or better on standardized tests than do non-CSMP classes. It should be pointed out that standardized testing and traditional programs are correlated, and that CSMP students have been exposed to a great deal of mathematics that is not taught in more traditional programs or that is not considered in the construction of the tests. There are also many unmeasurable or unmeasured areas such as enjoyment of mathematics, strategic thinking, organizational ability, and depth of understanding of the methods and uses of mathematics where we feel CSMP students have a definite advantage. Evaluation Report 1-A-3 in the CSMP Evaluation Report Series gives a more detailed answer to this question. Copies are available upon request.

25.Q: WHAT PROBLEMS WOULD CSMP STUDENTS HAVE IF THEY RETURN TO A MORE TRADITIONAL PROGRAM IN THE NEXT SCHOOL YEAR?

A: There should be no problems for CSMP students who return to a traditional program. Test results indicate that CSMP students are at or above the level of non-CSMP students in material covered in traditional courses. In addition, CSMP students have encountered many situations that are not introduced in traditional programs nor tested for on standardized tests (see Question 24). In particular, their reasoning ability should be much sharper than their non-CSMP counterparts.

26.Q: WHAT ARE SOME WAYS TO ORGANIZE MATERIALS AND MANAGE MY CLASS?

A: It is very important to organize your CSMP materials before school begins. Decide where you will store the materials once they are organized. Filing drawers, shelves, boxes, or closets are all satisfactory as long as you can easily get to the materials. Take them all out of their shipping boxes and spread them on several tables and/or desk tops in your classroom so they can be organized into the order you will be using them.

Worksheets: There is a separate worksheet booklet for each student and you should decide whether you will store these booklets and pass them out when a particular lesson calls for a worksheet, or simply let the students keep their own worksheet booklets in their desks.

Each worksheet can be removed from the booklet or left in depending on how you wish to manage worksheets. However, once a worksheet is removed from the booklet it cannot be replaced, so make sure students are careful about tearing off the correct sheet.

Manipulatives: Storage of each manipulative in a separate container, properly marked, is one way to make everything accessible. Another way is to provide a sturdy box (for example, a shoe box) for each student and to put individual manipulative materials in the box, properly labeled with the student's name.

Additional Materials: Be sure that you have plenty of high quality colored chalk, large sheets of unlined white paper, and that your students have colored pencils, pens, or crayons. Plan well ahead to be sure you have any needed materials that are not supplied by CSMP. Early Warnings about such materials are given on Adjustment Days. Keep all teacher materials where they are easily accessible. You may find the guides easier to use if they are put in looseleaf binders; the books are perferated so that pages can be removed easily. The demonstration Minicomputer boards, the number line, and the 0-109 numeral chart should always be on display in the room.

27.Q: SOME OF THE CSMP MATERIAL IS NEW TO ME. HOW DO I LEARN ENOUGH TO TEACH A CLASS?

A: Every CSMP teacher should have been trained by his or her coordinator. Kindergarten and first grade teachers receive a minimum of 18 hours training, teachers of the Upper Primary Grades Program receive up to 32 hours training, and teachers of the Intermediate Grades Program receive up to 56 hours training. During the training sessions the CSMP content is taught to new teachers and suggestions are given for organization of their classes.

If the suggested training schedule has been followed, many lessons taken from the CSMP curriculum, or very similar lessons, have been presented. The training schedule also makes use of the spiral approach so that training sessions aim not only to teach CSMP mathematics but to familiarize teachers with the spirit and pedagogy of the CSMP curriculum.

28.Q: WHAT SHOULD BE DONE WHEN THERE IS A SUBSTITUTE TEACHER?

A: Some school systems have included people who frequently substitute in their CSMP training program. When this is not the case, it would be very difficult for the untrained substitute to teach from CSMP materials. One solution is to arrange for another CSMP teacher to teach math to your class while the substitute teacher teaches another subject to that teacher's class. If that cannot be arranged and you will only miss one or two days, you may find certain CSMP material, uncompleted workbooks for example, that the substitute can manage. Otherwise, use those days to cover material not included in the CSMP curriculum, such as telling time. If your absence will be an extended one, arrangements should be made with your coordinator to train a substitute, rearrange schedules to put a CSMP teacher in your class, or otherwise provide for your students.

29.Q: THE PROGRAM MAKES USE OF THE STUDENT'S CREATIVE FREEDOM. HOW MUCH ROOM IS THERE FOR THE TEACHER'S INGENUITY?

A: CSMP not only allows for your ingenuity but depends on it. While the lessons may appear to be very rigid by presenting a dialogue for teacher and student, it should be remembered that these are suggested questions, answers, and comments based on our experience with development classes. Even if you were to follow your part of the "script" your students are likely to offer responses which differ from those we have listed. It is the student's response that will determine the content and direction of your next question or comment.

In a traditional program your creativity is called upon the first time you develop a particular lesson, and to a lesser extent, as you revise lessons in succeeding years. There is little room for spur-of-the-moment creativity once a lesson begins. The CSMP curriculum, by creating a free and open situation emphasizing the student's creative freedom, continually presents you with unanticipated student response and calls on your ingenuity at all times.

30.Q: HOW CAN I EXPLAIN CSMP TO PARENTS?

A: The best way would be for your coordinator to organize a workshop for interested parents. The parents can then see the languages of the program in use and have some of the same experiences their children have had. Workshops can be of almost any length but anything short of two hours does not allow for much familiarity with the material. In such a workshop, we would suggest that the language of the Minicomputer be explained with particular emphasis on its use in presenting situations where mental arithmetic is called upon and in developing algorithms (for example, physically carrying a checker from the ones' to the tens' board to make the "8 + 2 = 10" play parallels "carrying" in the paper and pencil operation). A nonnumerical example, such as the brother-sister graph, provides a good example of the power of the language of strings. A numerical example, such as building a road from 2 to 23 using +5 and -2 arrows, will provide an introduction to the language of arrows. Lessons that are the favorites of your students would be excellent choices for a presentation to parents as well.

You might also extend an invitation to parents to visit your class during the math period. Many times such an invitation leads eventually to a closer parent-teacher relationship, with the parent offering voluntary services as an aide.

You will find a letter to parents at the end of this section which may be reproduced and sent home with the students.

TO THE PARENTS OF CSMP STUDENTS

Your child is participating in the Comprehensive School Mathematics Program's (CSMP) elementary school curriculum, developed under a contract with the National Institute of Education. While the program cannot be fully explained in a brief note, we hope that this letter will give you some feeling for the substance of your child's mathematics education.

The goals of the CSMP K-6 program include a development of the standard number systems and their operations (including an early introduction to the integers, rational numbers and decimal numbers) interwoven with a development of geometry and measurement. On an equal footing with the above, the CSMP program includes a strong component of probability, statistics, and combinatorics which extends throughout grades 2-6. Powerful pedagogical devices are used, such as several nonverbal languages. These make the unifying ideas of the program accessible to very young children.

These languages include:

1) The Language of Strings This "language" mimics the basic methods of collecting and classifying data applying to the problems at hand. That is, it deals with the fundamentally useful and important mathematical notion of set.

2) The Language of Arrows This graphical language models the process of comparing and analyzing sets and operations on them. That is, it deals with the mathematical notions of relations and functions including, but not restricted to, ordering relations and the numerical processes of adding to, subtracting from, multiplying by, and sharing equally among.

3) The Language of the Papy Minicomputer The Papy Minicomputer, an extremely effective paper abacus invented by Georges Papy, models the positional structure of our system of numeration and lends itself to a multitude of numerical algorithms, including the standard algorithms for the basic numerical operations.

Among other things, these languages allow for the development of the basic operations on numbers in a natural way based on previous experiences with the languages. They also provide a context in which situations arise that call for the repeated use of arithmetic operations without resorting to drill exercises, which most children find boring.

The content is learned in an atmosphere of constant applications utilizing a "pedagogy of situations".* These vary from simple story situations in the early primary grades to challenging applications and nontrivial simulations of real world problems in the upper grades.

One of the tenets of CSMP's development philosophy is that mathematics is a unified whole and should be learned as such. As a result, along with CSMP's concern with the variation in ability levels in the typical heterogeneous class, the curriculum is structured in a spiral format throughout the K-6 program. The content is completely sequenced in spiral form so that each student is brought into contact with each area of content continuously throughout the program. This consciously avoids atomizing the content and mastering each bit before continuing to the next. Rather, each student spirals through repeated exposures to the content, building interlocking experiences of increasing sophistication.

Another tenet of CSMP's development philosophy, based on years of experimentation in the classroom, is that no single method of classroom management suffices to meet the needs of every student. Hence, the program is constructed to allow numerous opportunities for whole class participation, small group participation, and individual independent experiences. Individualization throughout the K-6 program is achieved through the independent work on workbooks and worksheets of varying levels of difficulty. Due to the spiral nature of the curriculum, each student can engage in a workbook without losing touch with the progress of the class while at the same time working to the limits of his or her ability.

---

* Inspired by the work of the mathematician and psychologist, Caleb Gattegno.

A feature unique to the CSMP program is a collection of storybooks written by Frédérique Papy (STORIES BY FREDERIQUE). These probe the affective domain of learning and bring children into contact with mathematics at levels until now unexplored.

CSMP does not have its own system of student assessment and progress reporting. While standardized testing indicates that CSMP students develop the "basic skills" as early or earlier than do non-CSMP students, we hope you will not be obsessed with your child's development of these "skills". Each child is an individual and should not be judged against norms but on what he or she can and does accomplish. Many extremely important areas -- development of self-confidence, ability to think and reason, etc. -- are very difficult to measure and grade. If you have any questions regarding the progress of your child, his or her teacher is in the best position to answer those questions.

THE CSMP STAFF

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DAY-BY-DAY GUIDE

[L] Languages of Strings and Arrows

[N] Numerical

[G] Geometry and Measurement

SECTION THREE: DAY-BY-DAY GUIDE

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F0 Things To Do Before School Begins

1. Hang the number line except for the negative portion. Above the chalkboard is a good place, but anywhere the students can see it, where you have easy access to it and where it does not need to be hung in separate parts will do.

2. Hang the 0 - 109 numeral chart. It should be in a place where students can touch the numerals.

3. Attach a number line to each student's desk.

4. Be sure you have colored chalk.

5. Be sure you have plenty of unlined paper and a box of crayons or colored pencils for each student.

6. Decide how you want to organize student manipulatives: an envelope for A-Blocks, one for checkers and one for Tangram pieces for each student or pill bottles or a shoebox for each student, etc.

7. Prepare Demonstration C-rods with magnetic material or masking tape loops.

8. Try to borrow some student C-rods.

F 1

F1 Cats and Mice

CAPSULE LESSON SUMMARY

Progressively draw a number of dots which can be for cats or mice. Use a string to separate the cats from the mice. Use arrows to discuss a relation between the cats and the mice. Include many counting exercises in the discussion.

MATERIALS

Teacher: Colored chalk

Student: Paper; colored pencils, pens or crayons

DESCRIPTION OF LESSON

Start the lesson with a very short talk about cats and mice. For example,

T: Do any of you have a cat? What does your cat eat? People who live on a farm usually have lots of cats. Do you know why? Well, farmers' cats chase and eat mice. Today our story will be about cats and mice. All the dots I draw are for cats and mice.

For this story, draw large dots spread out across the entire board. Be sure the dots, strings and arrows are clearly visible (if necessary, draw them using the side of a small piece of chalk). The arrows you draw should be long, with the arrow heads drawn in about the middle of the arrows and preferably outside the string.

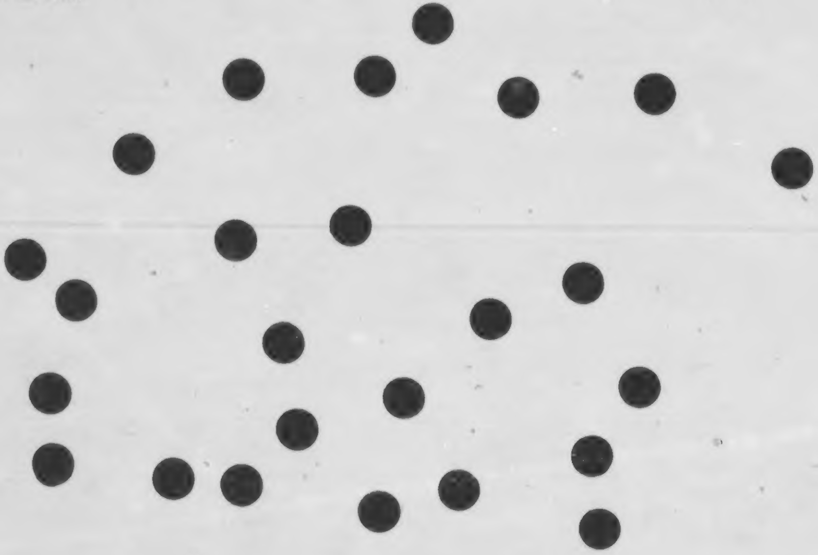
Draw a dot on the board.

T: One cat . . . or one mouse.

Draw two more dots.

T: How many altogether? (Three) What could they be? (Three cats; or three mice; or two cats and one mouse; or two mice and one cat)

Complete the drawing at the board. Let the children count the dots while you draw them.



T: How many dots? (25)

Ask someone to point to "25" on the number line. Ask everyone to point to "25" on their desk number line*. This may be difficult, so do not be upset if no one is able to do it.

---

*In many lessons, it is suggested that a student be asked to point to a numeral. Throughout the year, you will need to have the number line on display. It should be hung where it can be seen clearly and, preferably, as one continuous strip. In addition, you should stick the individual number line (provided with your CSMP materials) to each student's desk.

F1

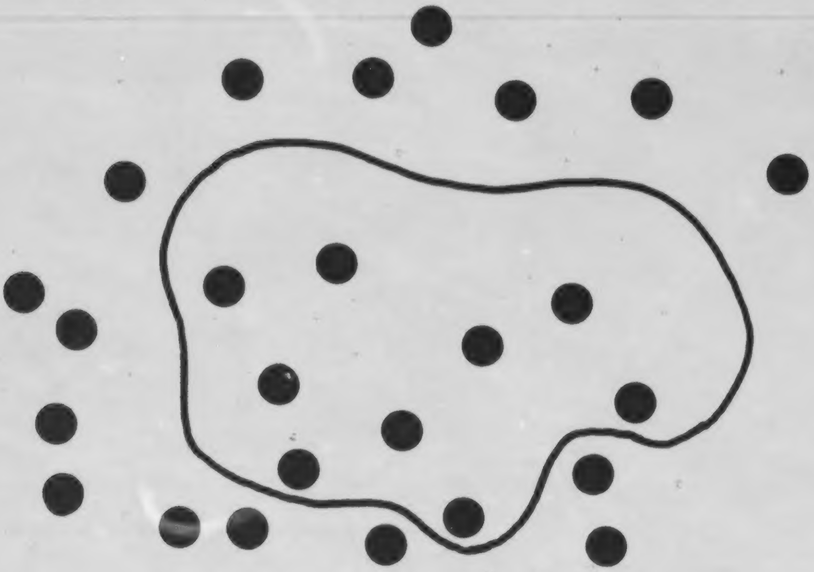
T: 25 animals. But which are the cats and which are the mice?

S: We can't tell.

T: That's correct. They may all be cats or they may all be mice or there may be some of each. I'll give you a clue to help you discover which are the cats and which are the mice.

Your students may try to guess which dot is for a cat and which is for a mouse. Ask how they can be sure. When they realize they cannot, give them this clue.

Draw a blue string enclosing nine dots.



T: All the cats are inside the blue string, but there are no mice inside the blue string.

Show me: one cat;
five mice;
two cats and three mice.

T: How many cats are there? (Nine) Show nine fingers.
Point to "9" on the number line. Trace a "9" with your finger on your desk.
How many mice? (16) Point to "16" on the number line.

T: What do you think is going to happen?

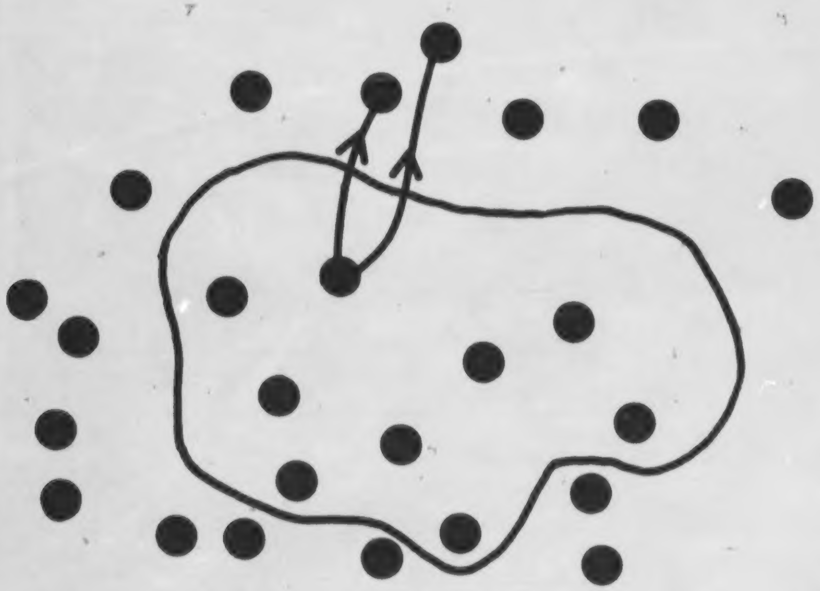
S: The cats are going to eat the mice.

T: Let's tell this story with red arrows.

Ask a volunteer to point to a cat.

T: This cat is eating two mice. You choose which ones.

Ask the student to trace two arrows with a pointer or with a finger; then draw them yourself. For example,



F 1

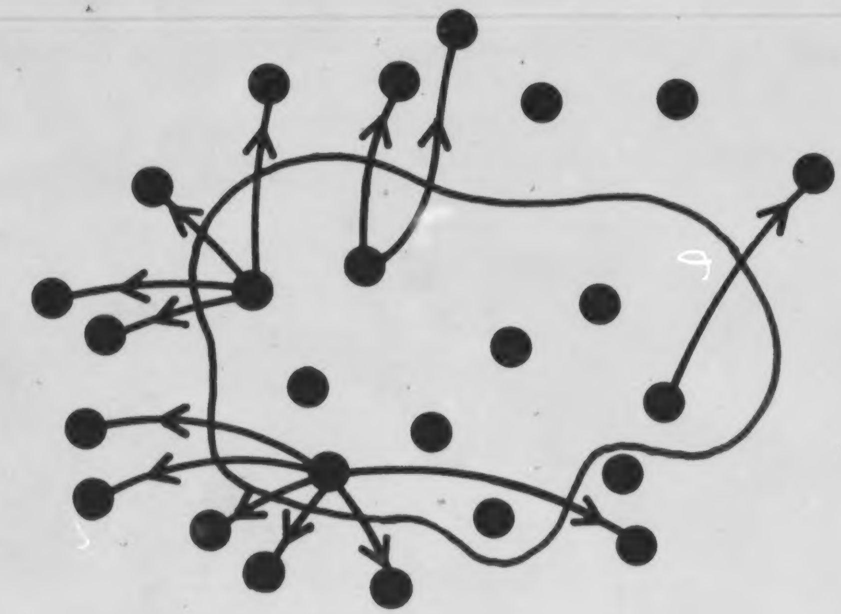
Ask another student to point to another cat.

T: This cat is eating six mice.

Ask the student to trace the arrows. Draw them. Continue drawing red arrows with the help of your class. Accept students' suggestions such as: "I can show a cat who eats four mice." Ask such questions as:

T: How many cats have eaten no mice yet?
How many mice are left?

Your story might end with this picture.



T: How many cats did not eat any mice? (Five)
How many cats did eat some mice? (Four)
How many cats are there altogether? (Nine; four hungry ones and five who were not hungry.)

T: Which cat ate the most mice?
How many mice were eaten? (Thirteen)
How many mice escaped? (Three)
How many mice are there altogether? (Sixteen)

Ask the students to draw their own "cats and mice" story. Ask them to write how many cats and how many mice are in their story. Suggest they draw all the arrows in the same color. Praise a good distribution of the dots.

F 2

F2.1 Numerical Activity #1

CAPSULE LESSON SUMMARY

Do some counting exercises to associate a numeral with a number of objects, to practice writing and recognizing numerals, to use words such as "more" and "less", and to write number stories. Use these activities to determine some mathematical abilities of your students so as to adjust future lessons.

MATERIALS

Teacher: Magnetic board, demonstration C-Rods, numeral cards
Student: None

NOTE: The demonstration C-Rods can be magnetized by pasting magnetic material* to the back of each rod. The magnetized C-Rods can be displayed on any metallic surface (such as a file cabinet) or a magnetic chalkboard. Alternatives to displaying the C-Rods on a magnetic board are preparing them for display on a flannel board or putting loops of tape on the backs of the C-Rods so they can be taped to the chalkboard.

DESCRIPTION OF LESSON

Observe your students carefully during this exercise to determine their mathematical abilities. This information will guide you in choosing exercises which meet the needs of your class.

Line up the numeral cards, in order, on the tray of the chalkboard. Do not overlap them. If your chalk tray is too short, use only some of the numeral cards and refer to the number line for larger numbers. Spread out the C-Rods on a table so they can be handled easily.

T: I am going to put some C-Rods on the board. Please watch carefully and show me, with your fingers, how many C-Rods there are.

---

* Extra magnetic material for this purpose is supplied with the A-Block String Game kit and is also available separately from CSMP.

Put three red rods and one blue rod on the magnetic board. Help any students who aren't showing four fingers.

T: How many C-Rods did I put up? (Four)
Who can point to "4" among the numeral cards?
We write "4" this way.

Turn your back to the class and trace a large "4" in the air. Ask the students to write a "4" in the air. Ask a volunteer to write a "4" on the board.

T: Can you tell me something about these C-Rods?

Accept all correct responses. Encourage, in a casual way, the use of the words:

same - different
above - below
left - right
long - short
more - less

If a student observes that there are three red rods and one blue rod, you can reply that "3 + 1 = 4". Ask the students to show "3 + 1" with their fingers, and write "3 + 1 = 4" on the board.

Repeat this sequence of activities for other numbers. You may vary the activity in many ways to prevent it from becoming boring; for example,

- point to a numeral and ask a student to put that many C-Rods on the magnetic board;
- ask a student to put more than five rods on the magnetic board;
- ask for less than ten rods;
- ask for two orange rods and five white rods.

F 2

For numbers larger than 10, students can pair up to show that many fingers.

End this activity by counting in unison from 1 to 10 and then backward from 10 to 1. Point to the appropriate numeral card as each number is counted.

F2.2 Bedtime for Birds

CAPSULE LESSON SUMMARY

Draw a number of dots which are for birds. Use strings to group the birds living in the same nest. With this situation do many counting, numeral writing, and numeral recognition exercises.

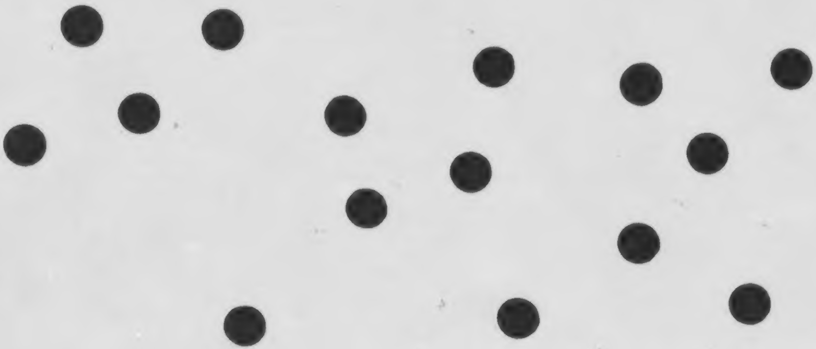
MATERIALS

Teacher: Colored chalk, pointer
Student: Worksheets F2.2*, **, ***, ****

DESCRIPTION OF LESSON

Draw the dots spread out across the entire board. Be sure the dots and strings are clearly visible.

T: I am going to draw some birds. They live in a forest. Count them to yourself while I draw.



T: How many birds? (15)

Ask some students who did not answer this question correctly to come to the board and count the dots, using a pointer to indicate each dot as it is counted.

F 2

Encourage different students to start counting from different dots. Allow the class to give verbal assistance to the one who is doing the counting.

T: There are 15 birds.
How many fingers do you have?
How many children do we need to show 15 fingers?

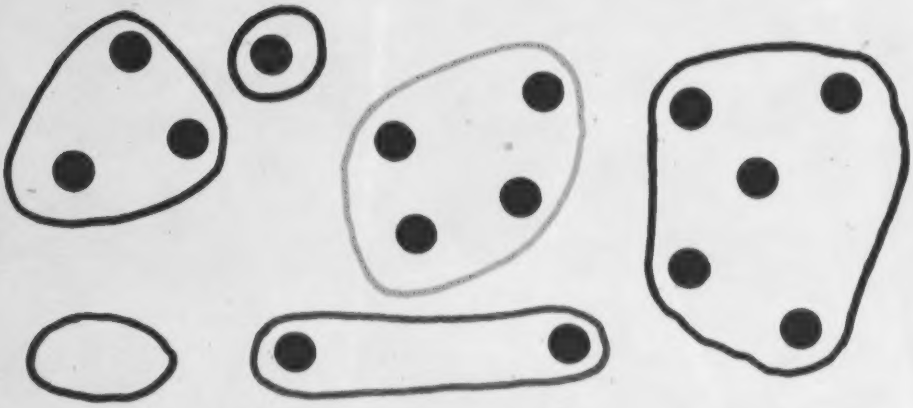
You are looking for the answer "two", but any number larger than two should be accepted as a correct answer even though only two children are needed.

Ask two students to come up to the front of the class and show 15 fingers.

Have someone point to "15" on the number line.

T: Close your eyes.

While the students' eyes are shut, complete your picture on the board by drawing six strings.*



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*Use six different colors, but not white.

T: Open your eyes again. What happened?

Let the pupils react. After a while, tell your story.

T: It was getting late, and the birds flew home to their nests. I have put all the birds living in the same nest into the same string, and the only things in the strings are birds.

Ask various questions about your completed drawing. For example,

T: How many birds are there in the yellow string? (Four)

Encourage students, if they can, to answer without counting.

T: Who would like to point to "4" on the number line? Trace a "4" with your finger on your desk.

In one nest there are exactly two parrots. Point to them in the picture. Who would like to write "2" on the chalkboard?

Is there a string with five birds in it? With six? With seven? One with ten birds?

Are there two nests which house the same number of birds?

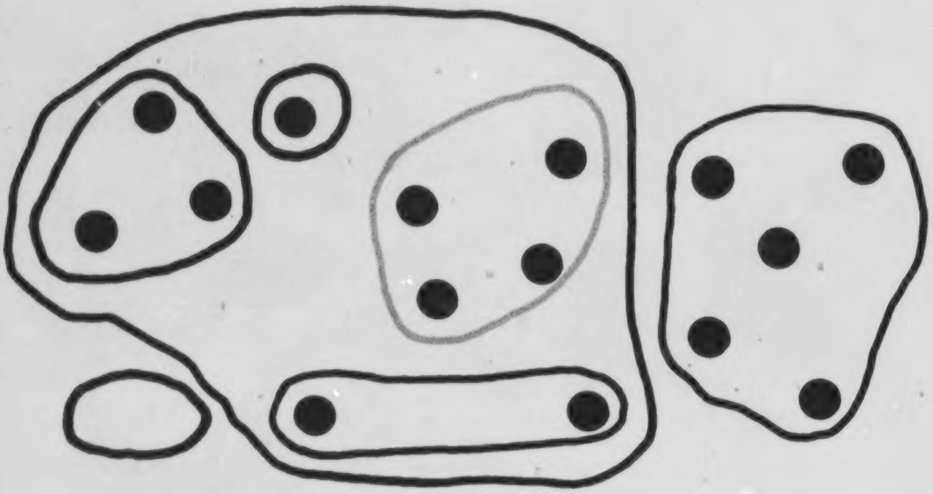
Show me the string with the most birds in it. (The red one)
How many birds are there in this string? (Five)
Clap five times.

Show me the string with exactly one bird in it. (The purple one)
What can you say about the orange string? (It's empty; there are zero (no) birds in it.)

F 2

T: Some of these birds have planned a picnic together for the next morning; I'll draw a white string around them.

(The white string is printed below in black.)



T: How many birds are going on the picnic? (Ten)

This question might be more easily solved if you erase the strings inside the white string.

T: How many birds are not going on the picnic? (Five)
How many birds are there altogether? (Fifteen)

Arrange the students in pairs. Ask each team first to show ten fingers. Then ask them to show five fingers. And finally, fifteen fingers.

Distribute Worksheets F2.2* and **.

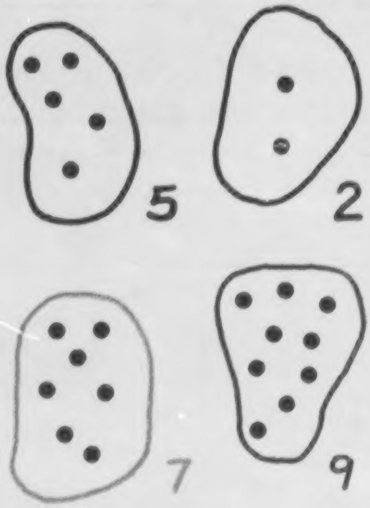
T: What is the green number? (Five)

This tells you that exactly five birds live together in one nest. Draw five dots in the green string.

Students who complete F2.2* should do F2.2** on the back. Upon completing F2.2**, students should be given F2.2*** and F2.2****. Explain that the dots show how many birds live in the nest. Students are to write the numerals.

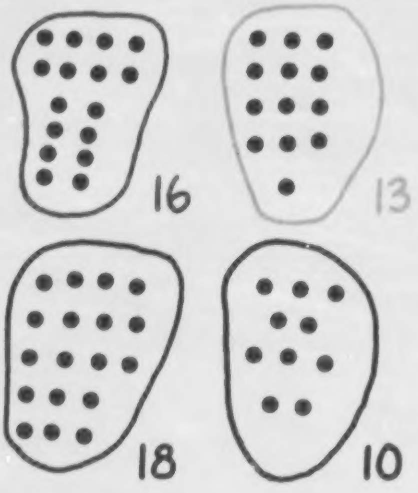
Name ____________ F 2.2 *

Draw the correct number of dots.



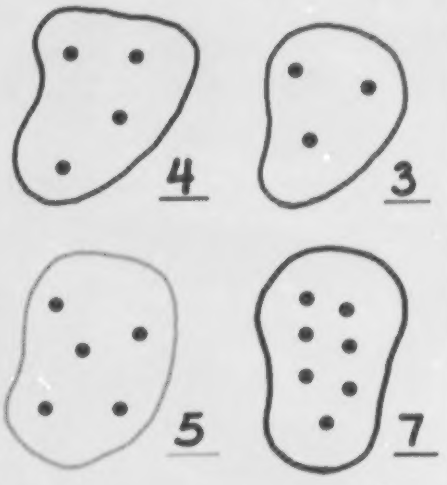
Name ____________ F 2.2 **

Draw the correct number of dots.



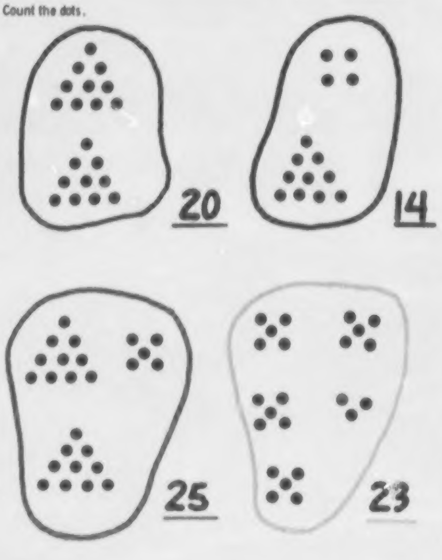
Name ____________ F 2.2 ***

Count the dots.



Name ____________ F 2.2 ****

Count the dots.



F3 Numerical Activity #2

CAPSULE LESSON SUMMARY

Do some counting exercises to associate a numeral with a number of objects or tapping sounds. Progressively build a staircase of C-Rods using words such as "shorter" and "longest", and identifying colors.

MATERIALS

Teacher: An opaque container with demonstration C-Rods, demonstration numeral cards, magnetic board, tapping instrument

Student: Worksheets F3*, **

NOTE: Exercise 3 of this lesson requires you to make distinct tapping sounds. Test several objects before class to discover what sounds best in your classroom.

DESCRIPTION OF LESSON

Exercise 1: Numeral Recognition

Have the numeral cards from "0" to "10" in random order in a stack. Tell the students that you are going to show them a number and they should hold up that many fingers. Go through the numeral cards quickly, helping students who have difficulty.

Exercise 2: Staircase with C-Rods

T: Who remembers the C-Rods we worked with yesterday?

Show the students the container.

T: The C-Rods are in this container. You must tell me which colors they may be.

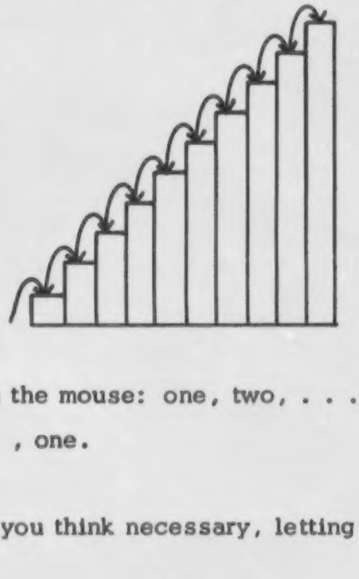
F3

If a student says "red", put a red C-Rod on the magnetic board. If a student says "pink", reply that you don't have any pink rods. If a student says "green", ask if the C-Rod is light green or dark green. Continue until one C-Rod of each color is on the magnetic board or until the students have no more suggestions. If you still don't have at least one rod of each color, put rods of the missing colors on the magnetic board one at a time, and ask the class what color each rod is. You should finish with one rod of each color on the magnetic board. Put the C-Rods to one side on the magnetic board.

T: Which is the shortest rod? (White)
Which rod is just a little bit longer? (Red)
And a little bit longer? (Light green)

As the students name the rods in order, construct a staircase at the board using the C-Rods.

When the staircase is finished, ask the students to imagine a mouse climbing the stairs, counting as he goes. Demonstrate as the class counts.



T: Let's count with the mouse: one, two, . . . , ten. And down again: ten, nine, . . . , one.

Repeat this as often as you think necessary, letting the students count in unison.

71

Exercise 3: Rhythm

Tap a sequence of sounds on a desk. The students are to listen and tell you how many times you tapped. Be sure to indicate when you start and when you stop a sequence of taps. For instance,

T: Ready! Tap, tap, tap, tap. How many? (Four)

Be sure to include some sequences such as:

T: Ready! Tap, tap, (pause) tap, tap, tap. How many? (Five)

If you will have ten minutes left for the worksheets, your class may enjoy a more challenging version of this activity.

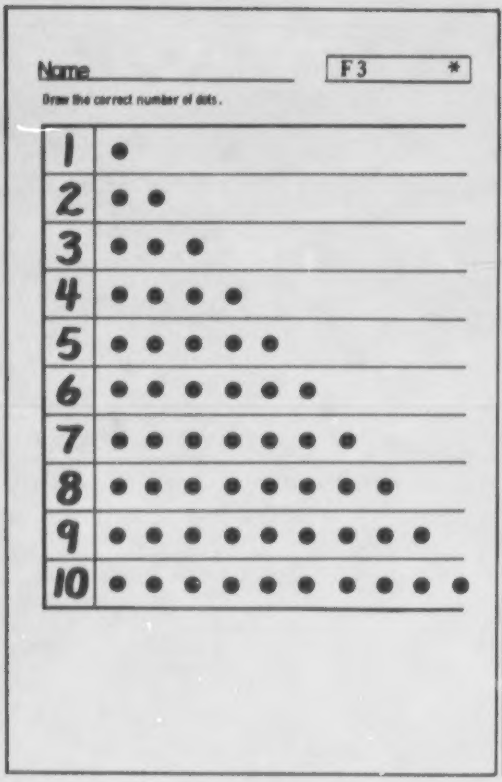
Tap a sequence of sounds on a student's desk. This student should reproduce the sequence exactly (by tapping on the desk), while the class listens to check the answer.

Exercise 4: Numeral Recognition Worksheet

Hand out Worksheets F3* and F3**. Ask the students to draw the correct number of dots beside each numeral.

Allow no more than 10 minutes for the worksheets. You could suggest that those who finish quickly write the numerals from "0" to "10" in order at the bottom of the second worksheet. If they can write beyond "10", let them continue. If you see someone has written the numerals as far as "25" or more, mention this to the class.

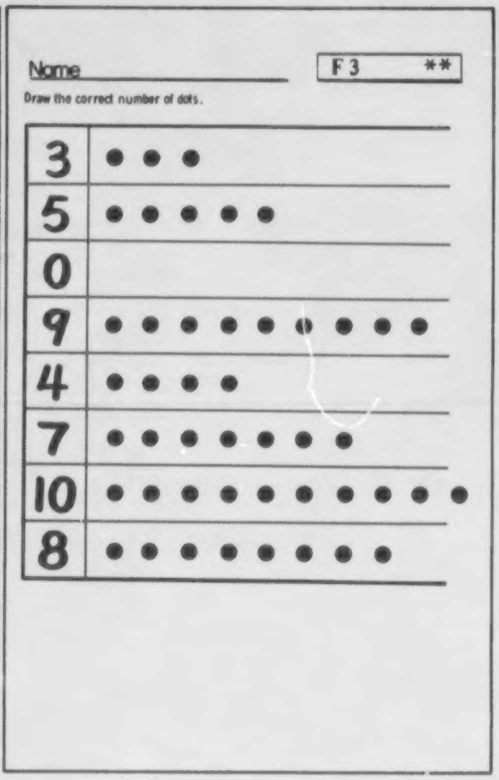
The students who have not finished after 10 minutes need more practice. Give them a similar sheet in a few days.



Name____________________ F 3 *

Draw the correct number of dots.

1	●
2	● ●
3	● ● ●
4	● ● ● ●
5	● ● ● ● ●
6	● ● ● ● ● ●
7	● ● ● ● ● ● ●
8	● ● ● ● ● ● ● ●
9	● ● ● ● ● ● ● ● ●
10	● ● ● ● ● ● ● ● ● ●



Name____________________ F 3 **

Draw the correct number of dots.

3	● ● ●
5	● ● ● ● ●
0	
9	● ● ● ● ● ● ● ● ●
4	● ● ● ●
7	● ● ● ● ● ● ●
10	● ● ● ● ● ● ● ● ● ●
8	● ● ● ● ● ● ● ●

F4 One to One Correspondence

CAPSULE LESSON SUMMARY

Draw some colored dots for students and, in another color, draw dots for dogs. Pair the different color dots to establish a one-to-one correspondence between the students and the dogs.

MATERIALS

Teacher: Colored chalk

Student: Paper; colored pencils, pens or crayons

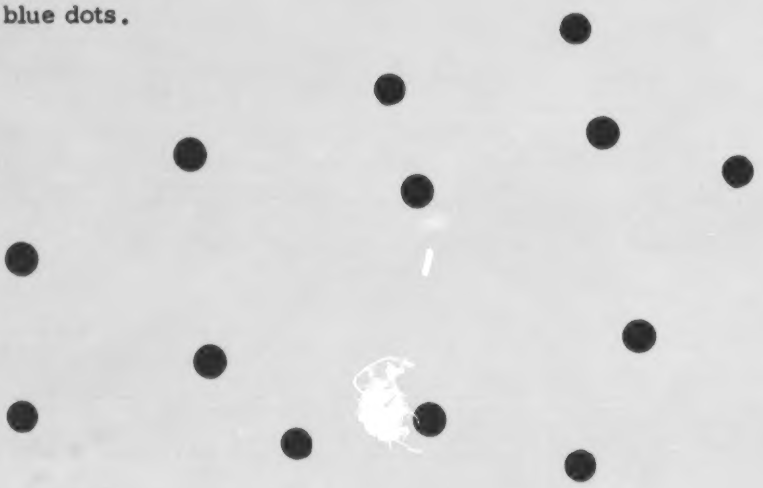
DESCRIPTION OF LESSON

Draw seven red dots on the board.

T: These red dots are for children. How many are there? (Seven) Now I am going to draw some blue dots. They are for dogs.

F 4

Draw six blue dots.



S: Six dogs.

T: Right. Seven children and six dogs.

Write "7" in red and "6" in blue beside the drawing.

T: Each child wants to take one dog for a walk. What do you think is going to happen?

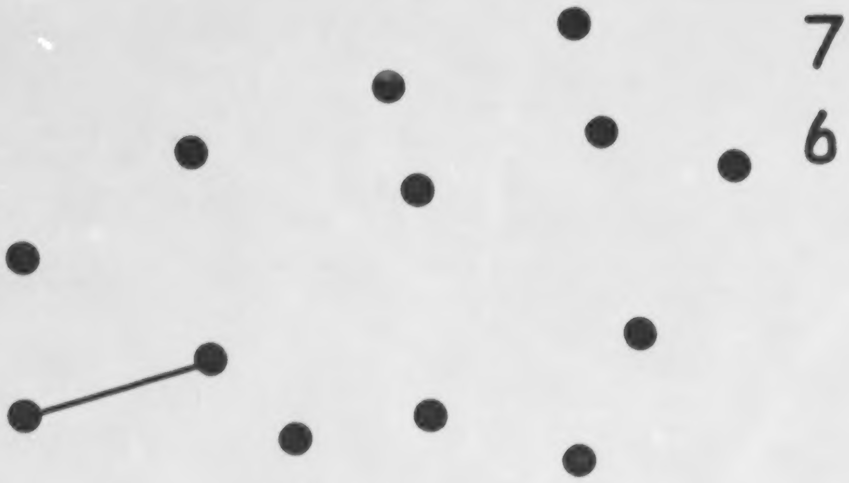
S: There will be a fight?

S: Two children will have to go together.

Answers such as these indicate that your students have the right idea. In any case, be noncommittal and say:

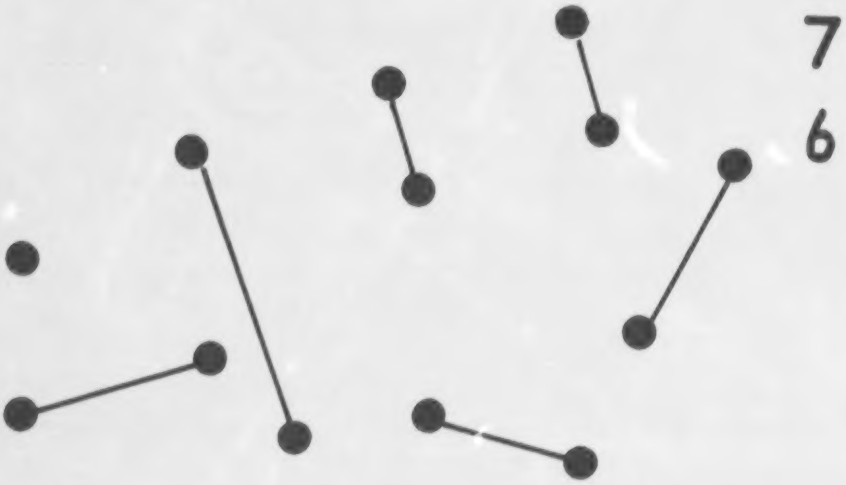
T: Well let's see. This child takes this dog.

Show a red dot paired with a blue dot.



While it would not be wrong to draw an arrow, it is unnecessary since the dogs and children are distinguished by the color of the dots.

Have students come to the board to finish pairing off the dogs and the children. For instance,



F 4

If you were not very successful when you first asked "What do you think is going to happen?", you could ask again when there are only two red dots and only one blue dot left.

When the drawing is completed, ask:

T: Does every child have a dog? (No)
Does every dog have a little master? (Yes)
In my story, there are seven children and six dogs.
Are there more dogs or more children?

S: Children.

T: Right. Seven is larger than six. Six is smaller than seven. There are more children. How many more? (One)

Erase the board and draw eight red dots and ten blue dots.

T: How many of each?

S: Eight children and ten dogs.

T: Right.

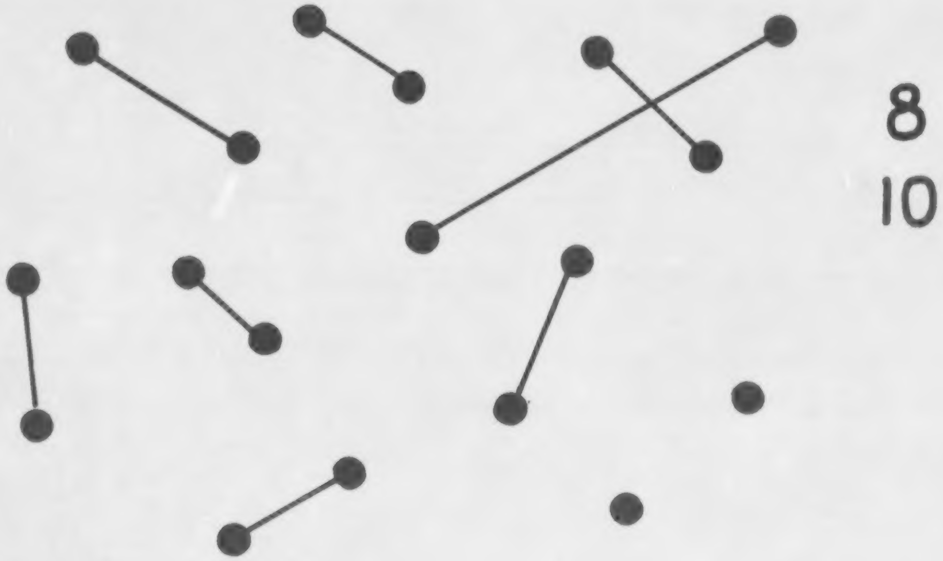
Write "8" in red and "10" in blue on the board.

T: Are there more dogs or more children?

S: More dogs.

T: How many more? (Two, but don't worry if no one can answer this question.) Let's check.

Have some pupils quickly pair off the children and dogs.



F 4

T: Does every child have a dog this time? (Yes)
Does every dog have a master? (No)
So you were right. Ten is larger than eight. Eight is smaller than ten.
There were more dogs than children.
How many more?

S: Two.

Have someone point to the two dogs without masters.

Erase the board.

T: In the first story, there were more children than dogs. In the second one, there were more dogs than children. I would like you to draw a story, with the same number of children as dogs.

When most of the students have finished, ask some of them to show their drawings to the class. Comment on them; for example,

T: John, how many children in your picture?

S: Five.

T: And how many dogs?

S: Five.

T: Very good! Sam, you have 10 children and 11 dogs. Does every child have a dog?

S: Yes.

T: Does every dog have a master? Look carefully.

S: No.

T: Look at Mary's drawing. There are a lot of dots, but we can easily see that every child has a dog and every dog has a master. Very good!

F 5

F5 Numerical Activity #3

CAPSULE LESSON SUMMARY

Do some counting exercises to associate a numeral with a number of objects, to use words such as "more" and "less", to write number stories, to show the same number of objects in many ways, and to order the first twenty or so natural numbers.

MATERIALS

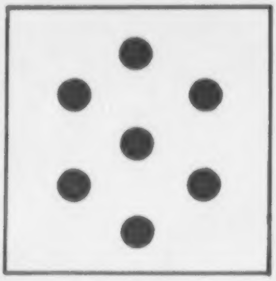
Teacher: Magnetic board, magnetic checkers
Student: Dot-to-dot worksheets*

NOTE: As soon as you feel that the class is losing interest in one of the activities, switch to the next one.

DESCRIPTION OF LESSON

Exercise 1: Transforming a Number #1

Display seven magnetic checkers on a magnetic board.



T: These are birds, and like most birds they are flying around. How many birds are there? (Seven)

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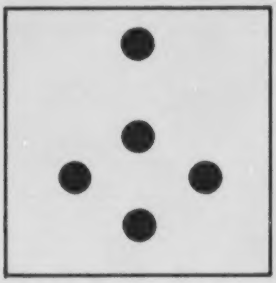
*Because many classrooms already have dot-to-dot worksheets similar to those described in this lesson, the sheets have not been included with the CSMP classroom materials.

Remove two checkers being very obvious about what you are doing.



T: Are there still seven? (No)

Are there more or less than 7? (Less)

How many less? (Two)

How many birds are there now? (Five)

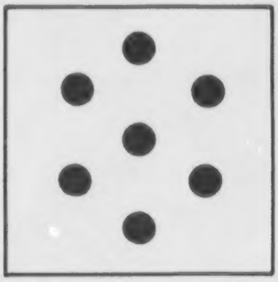
Write this number story on the board.

$$7-2=5$$

T: 7 minus 2 is 5.

Do not over-emphasize the number story. Treat it very informally.

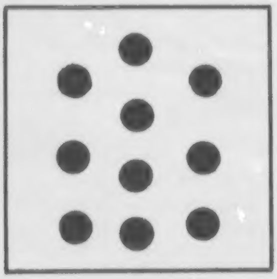
Put the two checkers back and erase the board.



F 5

T: How many now? (Seven)

Add three checkers, again being obvious about what you are doing.

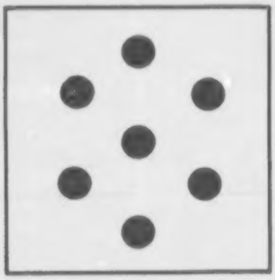


T: Are there still seven? (No)
Are there more or less than seven? (More)
How many more? (Three)
How many birds are there now? (Ten)

Write this number story on the board.

7 + 3 = 10

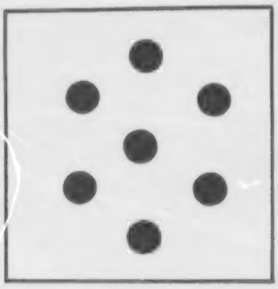
Do not over-emphasize the number story.
Take the extra checkers off and erase the board.



F 5

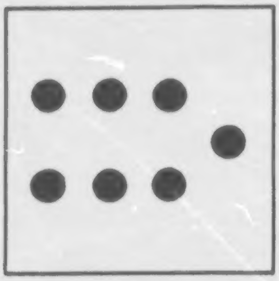
T: Here are the seven birds again.

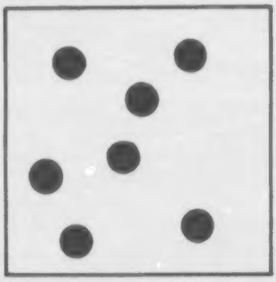
Replace (again, being very obvious) a red checker with one of a different color.

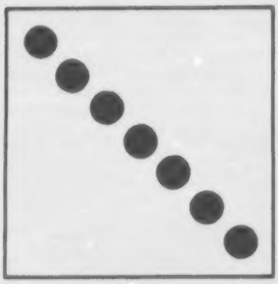


T: Are there still seven? (Yes)

Move the seven checkers around, without adding or removing checkers. You must be obvious about this.







T: Are there still seven? (Yes)

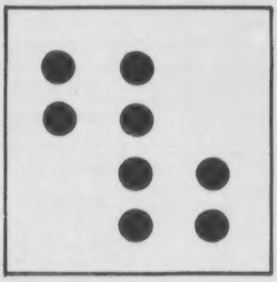
Alternate moves that change the number with those that do not change the number. Each time, ask if there are still seven birds. After each move, go back to seven checkers.

You could make this exercise into a game by asking the students to raise their hands if they think the number is still seven, and to put their hands under the table if they think it is no longer seven.

Exercise 2: Transforming a Number #2

When the students are familiar with the previous game, ask them to transform a number themselves. Give directions such as:

T: Here are eight checkers.
Make it less than eight.
Make it more than eight.

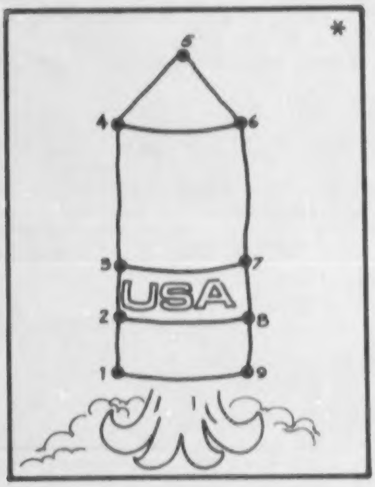


Between moves, go back to the initial configuration.

Exercise 3: Dot-to-dot worksheets

Before class prepare dot-to-dot worksheets of varying levels of difficulty. Use any worksheets you have available, or make worksheets using the samples provided on the next page.

Distribute worksheets and ask the students to draw a line from each number to the number which comes next when they are counting.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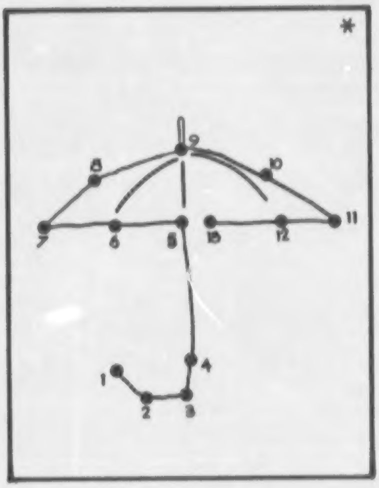
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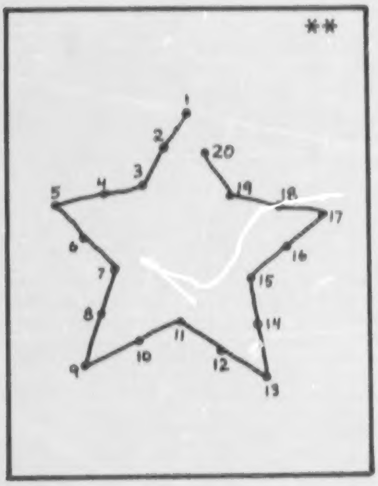
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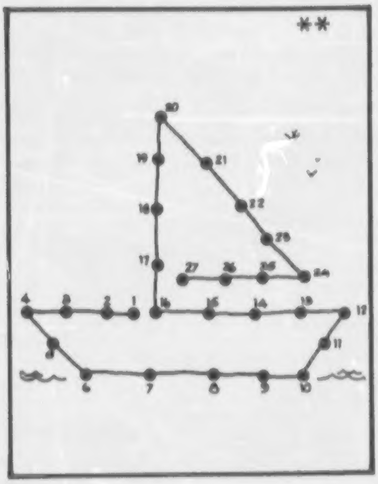
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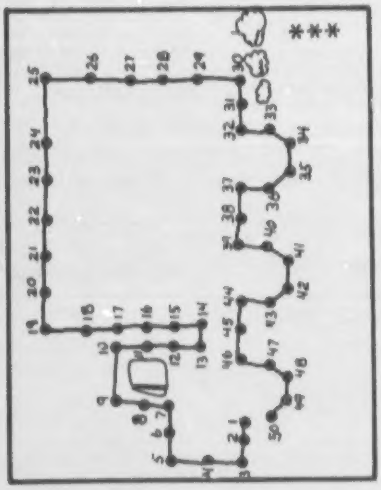
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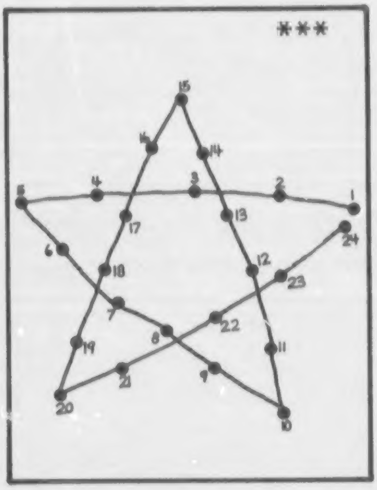
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F 6

F6.1 Walks on One-Way Roads #1

CAPSULE LESSON SUMMARY

Follow the arrows on a one-way road map and take some trips on the streets of a small town. Explore walks which are possible and impossible to make.

MATERIALS

Teacher: Colored chalk; pointer; First Grade, Part I Poster #1
Student: None

DESCRIPTION OF LESSON

Tape the First Grade, Part I Poster #1 to the board.

T: This picture shows the roads of a small town. All the roads in this town are "one-way" roads which run in the direction of the arrows.

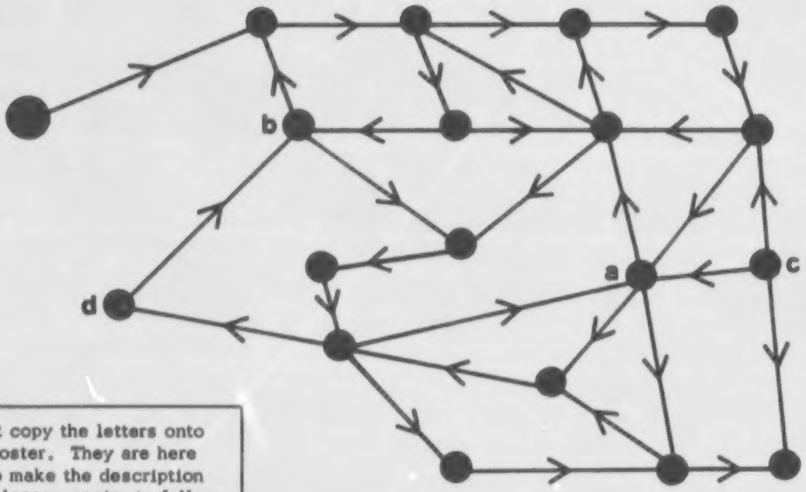
Have a student explain what a "one-way" road is.

T: What happens if you go the wrong way on a "one-way" road?

S: The police officer gives you a ticket.

T: I would like someone to take a walk through the town starting here (point to the big dot on the left of the map). The rest of the class can give a ticket by raising both hands, if someone goes the wrong way.

Let several students use a pointer to "take" walks starting at the big dot and see how far they can go before they get to a "dead-end" or get tired of walking. Have students trace walks until you feel the class has an understanding of what is meant by a walk.



Do not copy the letters onto your poster. They are here just to make the description of the lesson easier to follow.

T: This dot is a candy store (point to a).

Draw a blue string around the candy store to help the students to remember which dot it is.

T: Who would like to take a walk from the big dot to the candy store?

Allow several students to try this. There are several possible paths, of variour lengths. After one possible way is shown, ask for a different way.

On your map, draw a red string around the dot labeled "b".

T: This dot is for Dandy Dan's Ice Cream Parlor. Who can go from the candy store to Dandy Dan's?

Again, allow several students to trace walks. Ask for different ways.

Draw a green string around the dot labeled "c".

F 6

T: This is Bruno's Burger Stand.
Who can find a way from Dandy Dan's Ice Cream Parlor to Bruno's Burger Stand?

Let several students try.

S: It's impossible! All the arrows point away from Bruno's.

T: Poor Bruno! He may have to go out of business unless the city changes the directions of some one-way roads.

If the class is still interested, say:

T: In trying to get to Bruno's Burger Stand we did a lot of walking --- enough to make a person very thirsty! Fortunately, there is a refreshment stand right here (point to d).

Have a student trace a walk from the dot labeled "b" to the dot labeled "d".

F6.2 Numeral Writing Worksheets

CAPSULE LESSON SUMMARY

Practice writing numerals.

MATERIALS

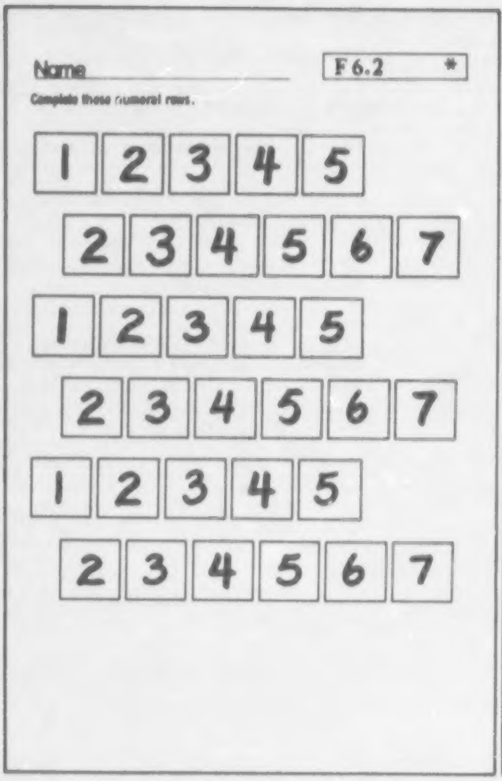
Teacher: None

Student: Worksheets F6.2*, **

DESCRIPTION OF LESSON

Distribute Worksheets F6.2* and F6.2**. Explain to the students that they are to complete the numeral rows by writing the missing numerals in the empty squares. Circulate among the students as they are working. If a student has written a numeral incorrectly, point to a correct example of the numeral on the worksheet and ask the student to write the numeral correctly.

You could suggest that those who finish quickly write the numerals from "0" to "20" in order at the bottom of the second worksheet. If they can continue beyond "20", let them go as far as they wish.



Name ____________ **F 6.2 ***

Complete these numeral rows.

1 2 3 4 5

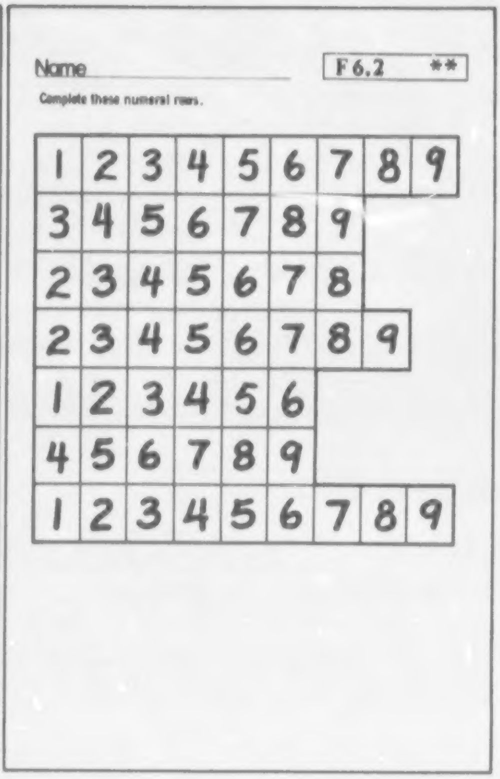
2 3 4 5 6 7

1 2 3 4 5

2 3 4 5 6 7

1 2 3 4 5

2 3 4 5 6 7



Name ____________ **F 6.2 ****

Complete these numeral rows.

1	2	3	4	5	6	7	8	9
3	4	5	6	7	8	9		
2	3	4	5	6	7	8		
2	3	4	5	6	7	8	9	
1	2	3	4	5	6			
4	5	6	7	8	9			
1	2	3	4	5	6	7	8	9

F7.1 Staircase Review

CAPSULE LESSON SUMMARY

Progressively build a staircase of C-Rods using words such as "shortest" and "longer". Count by twos.

MATERIALS

Teacher: C-Rods, magnetic board

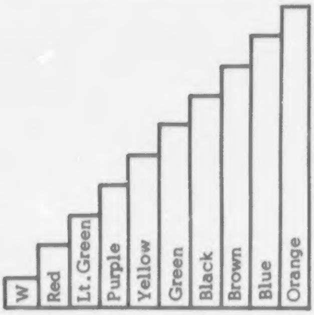
Student: None

DESCRIPTION OF LESSON

Review the colors of the C-Rods by asking:

T: Who remembers the color of the shortest rod? The one just a little bit longer? And the next one? . . . The longest rod?

As you are given answers, build a staircase with your rods.



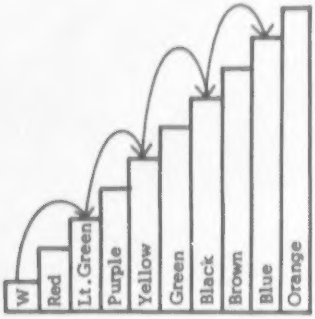
T: Let's imagine a grasshopper is going up and down these steps. Count with him as he goes from 1 to 10 and from 10 to 1.

F 7

Repeat the counting, but this time imagine that the staircase continues, and let the students count up to 25 or so. Then have them count backward.

T: Now let's imagine the grasshopper starts at 1 but climbs two steps at a time.

Demonstrate climbing the stairs two at a time,



as the students count: 1, 3, 5, 7, 9.

T: Now he comes down the same way. (Count: 9, 7, 5, 3, 1)

Repeat the same exercise with the grasshopper starting at 2.

If your class is interested, repeat this exercise but imagine that the steps continue, and ask the class to continue counting. Then come down the imaginary steps the same way, ending at 2.

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F7.2 The Little School

CAPSULE LESSON SUMMARY

Draw a number of dots which can be for pupils or teachers. Use arrows to show pupils running to their teacher. Do some counting exercises with this situation.

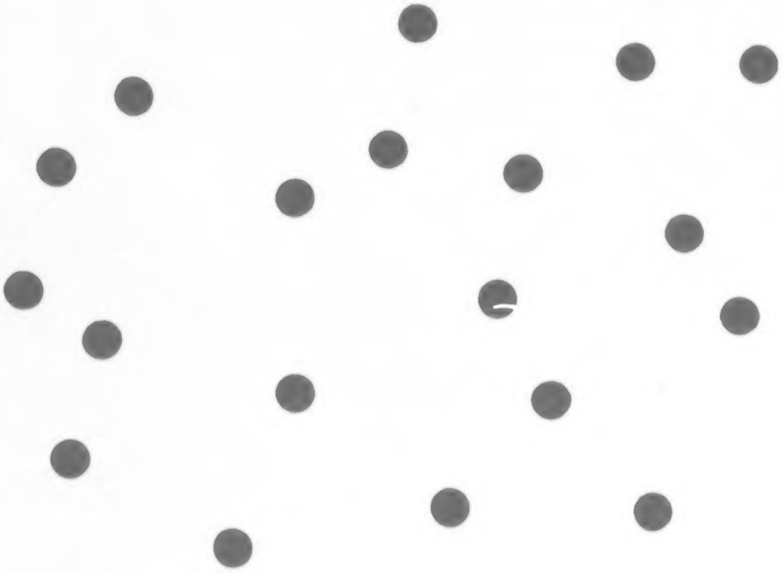
MATERIALS

Teacher: Colored chalk
Student: Colored pens, pencils or crayons; paper

DESCRIPTION OF LESSON

T: This story takes place in a little country school. There are not very many pupils in this school, and only a few teachers. At the moment, it is playtime and all the pupils and teachers are outside. Here they are.

NOTE: Draw the dots spread out across the entire board. Be sure the dots and arrows are clearly visible.



F 7

T: How many people? (19)

If your students did not count the dots at the same time as you were drawing, ask someone to do so now. Encourage different students to start counting from different dots. Allow the class to give verbal assistance to the one who is doing the counting.

T: 19 dots. What are they for?

S: Pupils.

T: Just pupils?

S: And teachers.

T: Do we know for sure which dots are for pupils and which dots are for teachers?

S: No, they all look alike.

Your students might try to answer the previous question by guessing. In that case, point to a dot and say:

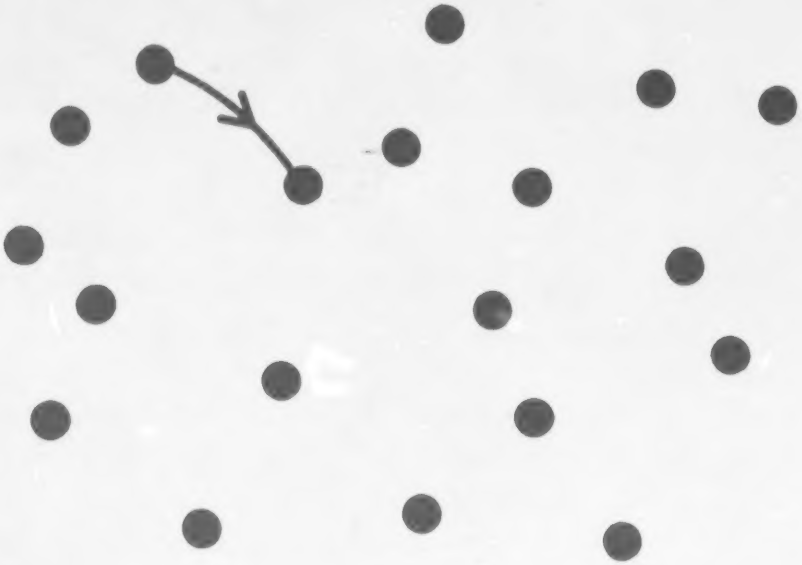
T: John thinks this dot is for a pupil, and Mary thinks it is for a teacher. There is no way to be sure!

In any case, continue:

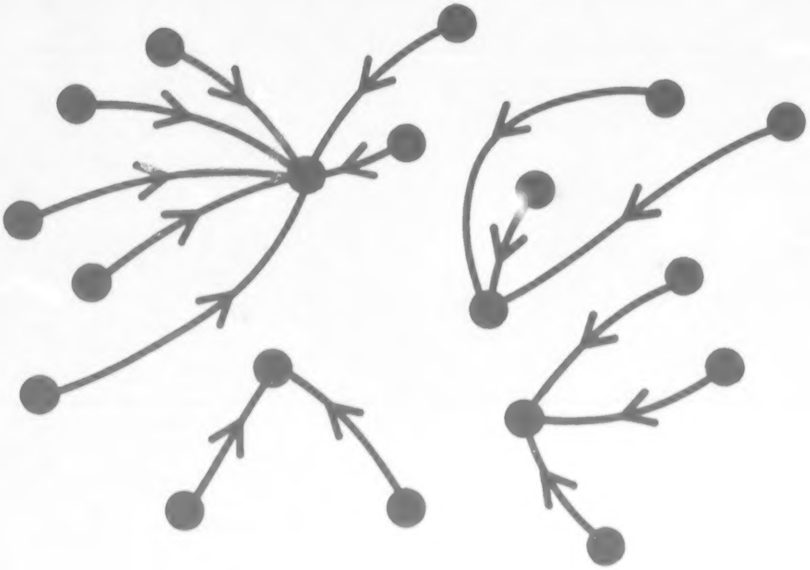
T: Let me go on with the story. Suddenly the bell rings. Of course, that means it's the end of playtime. Each pupil runs to the teacher in order to be ready for class. I am going to show this with a blue arrow.

Draw one blue arrow and repeat:

T: This pupil runs to this teacher.



Ask a student to designate which is the pupil and which is the teacher. Then, ask the students to close their eyes while you complete the arrow picture.



F 7

Ask students to note various things in your picture; for example,

T: Point to a pupil.
Point to a teacher.
Point to two pupils who have the same teacher.
This is a pupil (point to a dot). Can you show me his teacher?
This is a teacher (point to a dot). How many pupils does this teacher have? Show them all to me.

If you were discussing the teacher who has seven pupils, you could continue as follows:

T: Point to "7" on the number line. Write a "7" on the board.
Which teacher has the largest class? How many students are there in that class? (Seven)
Which teacher has the smallest class? How many students are in that class? (Two)

Point to the two teachers on the right of the picture.

T: What do you think about the classes of these two teachers? (They have the same number of pupils. They both have three pupils.)
Show me all the teachers. How many are there? (Four) With the pointer, trace a string around them.

Draw the string yourself.

T: How many pupils are there all together? (15)

Point to the two teachers at the bottom of the picture.

T: Sometimes these two teachers take their classes out for a walk together. How many pupils do they have all together? (Five)

Ask the same question for the two teachers at the top of the picture.

Let your students draw their own school story. Let them decide how many students and how many teachers there are. Encourage the students to make big dots, use the whole piece of paper, and use one color for all the arrows. Praise beautiful, clear drawings.

If some students finish quickly, you could let them draw whatever they like on the back of their paper. This will allow you to provide individual help for students who need it.

F8

F8 Addition Story #1

CAPSULE LESSON SUMMARY

Draw ten dots for pieces of candy. Use strings to show candies given to particular children. Explore different ways to distribute the candy and write number stories for the different ways.

MATERIALS

Teacher: Colored chalk

Student: Paper; colored pencils, pens or crayons

DESCRIPTION OF LESSON

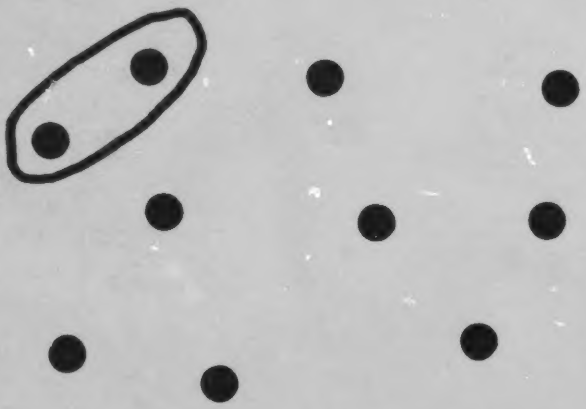
Draw ten dots on the board. Let the students count as you draw.

T: These are candies. How many are there? (10)

T: We will have to share these candies among some children. You will decide which candies each child gets. John, which candies do you want to give to the first child?

S: These two.

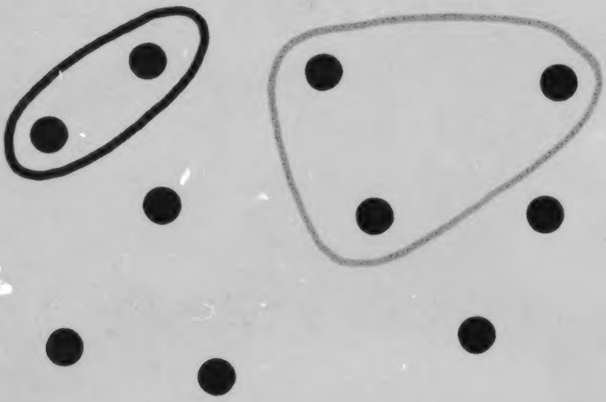
Draw a colored string around the two dots suggested by the student. For example,



T: Mary, how many candies do you want to give to the second child?

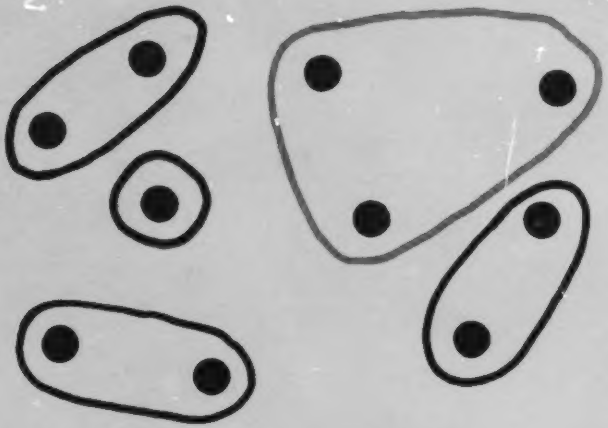
S: Three.

Have her trace a string around the three candies she wants to give the second child. Then you draw the string.



F 8

Continue calling on students to finish sharing the candies. Your completed drawing might look like this picture.



T: Who would like to explain our story again?

S: One child gets three candies, one child gets one candy and the three others get two candies each.

At the top of the board or beside the drawing, write a number story.

$$3+1+2+2+2$$

T: How many candies all together? (10)

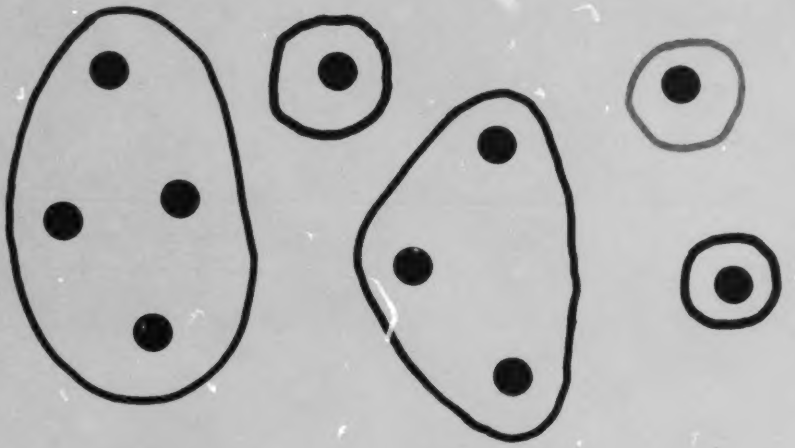
Finish your number story.

$$3+1+2+2+2=10$$

Erase the board and distribute unlined paper. Have the students draw ten dots and distribute candies any way they wish. Provide help if necessary, and make sure everyone has the right number of dots.

Students who finish quickly should be asked to find another way of sharing ten candies. Have them make a second drawing on the back of the paper.

After a while, ask the students to stop drawing and pay attention. Have one student show a drawing to the class, while another student comments on it. For instance, suppose this picture is being shown.



Another student might comment:

S: One child gets four candies, one gets three, and the others get only one.

T: How many candies are there all together?

S: Ten.

T: Let's write this story on the board.

$$4+3+1+1+1=10$$

F8

Do this for several pictures. Your board should be full of number stories for ten. You might let the two students, who are showing the picture and commenting on it, choose the next two students. This will probably keep the rest of the group more involved.

If you think your class is able, let students write the number stories on the board.

F9 Left Shoe - Right Shoe

CAPSULE LESSON SUMMARY

Draw dots for shoes and use "You are my right shoe" and "You are my left shoe" arrows to pair the shoes.

MATERIALS

Teacher: Colored chalk

Student: Paper; colored pencils, pens or crayons

DESCRIPTION OF LESSON

T: Raise your right hand.
Point to your left shoe.
Raise your left hand.
Point to your right shoe.

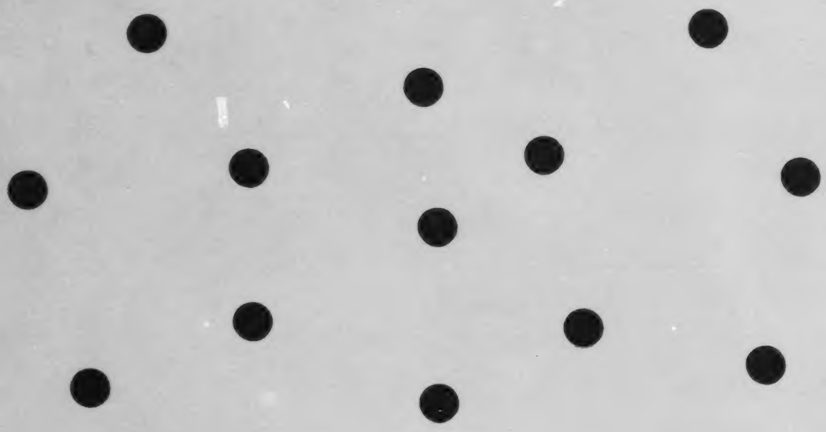
Make sure everyone knows that a pair of shoes consists of one left shoe and one right shoe.

T: I am going to tell you a story that happened in a tiny country school. The first graders of that school were going to have P.E. (or gym or recess). Of course, they had to wear sneakers (or tennis shoes or running shoes). They took off their regular shoes, and put them neatly in pairs along the wall. Then, they put on their sneakers and went outside. While the children were away, a third grade pupil played a joke on them. He went into the classroom, mixed up all the shoes, and threw them all over the room.

Here are the shoes all mixed up.

F 9

Draw dots for the shoes.



T: How many shoes? (13)

Have several children count the dots to check. Ask someone to point to "13" on the number line.

T: What do you think the children did, when they came back into the room?

Accept several suggestions, until you get a response like:

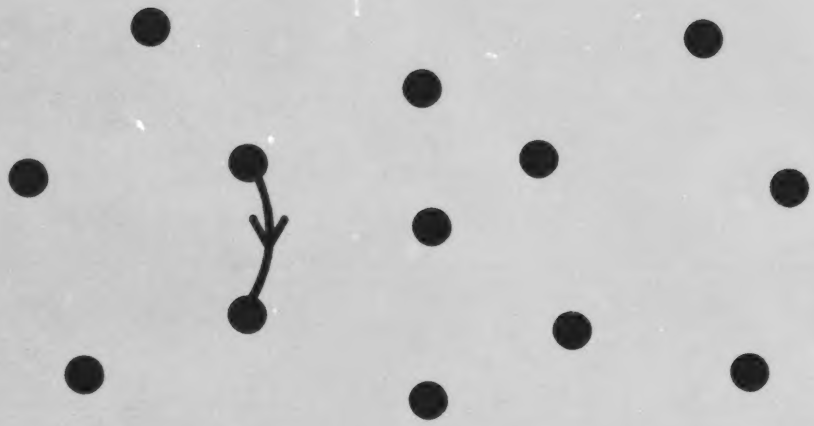
S: They made up the pairs again.

T: Right.
This is a left shoe (point to one of the dots). What do we need now?

S: The right shoe.

Draw one red arrow starting at the dot to which you just pointed, and say:

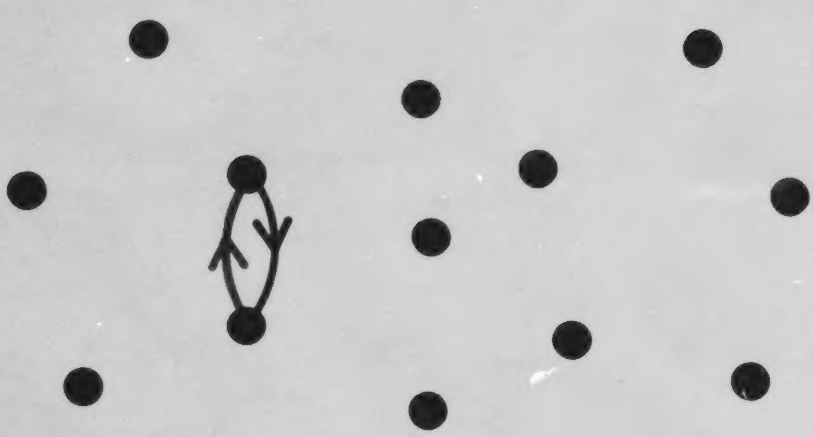
T: I am pointing to my right shoe.



T: The left shoe points to the right shoe. What is the right shoe going to answer?

S: I am pointing to my left shoe.

Draw the blue return arrow.



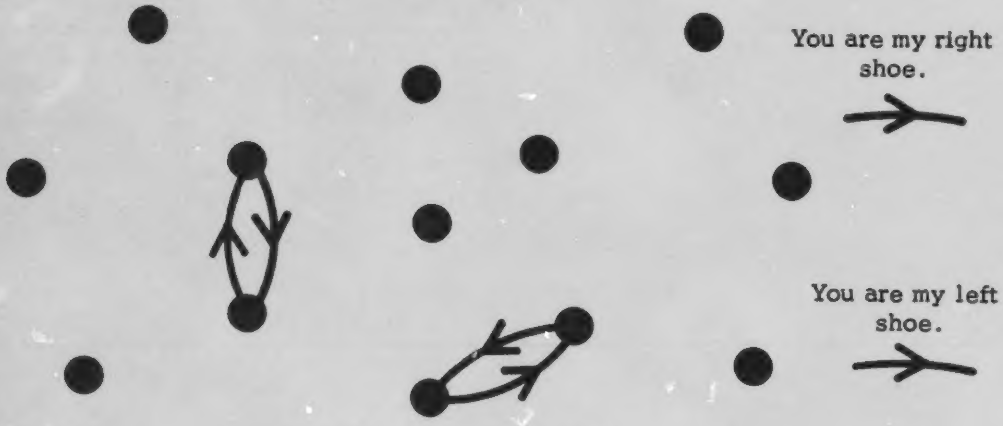
Write key arrows beside the drawing.

F 9

T: As I told you, it was a country school, and sometimes in the country children wear clogs. Here is a little right clog (point to a dot).

S: It will point to its left clog.

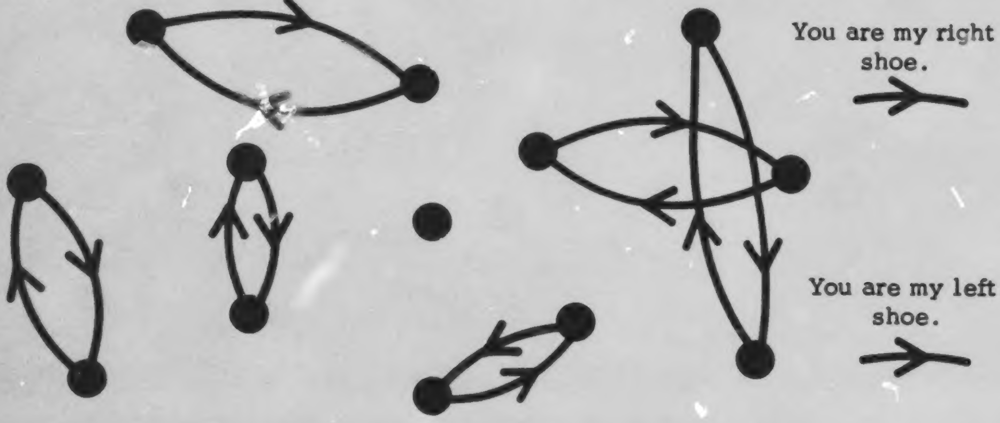
Designate another dot as being the left clog, and have a child trace the blue arrow and then the return arrow. You draw the arrows.


You are my right shoe.
You are my left shoe.

T: Here are two happy pairs of shoes!

Send students to the board to finish making up the pairs. They will have to decide which dot they want to be a left shoe and which they want to be its right shoe.

When this has been done, your drawing should resemble this one.


You are my right shoe.
You are my left shoe.

T: Look at the drawing. What happened?

S: One shoe is left over.

The students might enjoy telling what might have happened to the "lost" shoe.

T: Remember the red arrow is for: "I am pointing to my right shoe".

Point to a dot at the end of a red arrow and ask:

T: Is this a right shoe or a left shoe? (Right)

T (pointing to the end of a blue arrow): What about this one? (Left)

T (pointing to the unpaired dot): What about this one? (Can't tell)

T: Now, be careful. How many children are there in the class?

You may want the students to whisper in your ear, or have them show the answer with their fingers to give several of them a chance.

If many students answer "six", point to the single shoe and say:

T: This one belongs to a child, too!

The correct answer is seven (or more, if three or more shoes are missing). Let someone who answered correctly explain why this is so.

Distribute unlined paper.

F 9

T: You are going to draw your own story about 11 shoes.
Draw 11 beautiful black dots, and then make the pairs, using arrows of two colors.

This is a difficult task. The arrows might go in the wrong directions or be poorly drawn. Don't worry about this but provide individual help where needed.

F10 Adjustment Day #1

NOTE: See the General Introduction, p. 16 for a full explanation of the purpose of scheduled adjustment days.

On this day, you may wish to repeat a previous lesson either for a small group of students or for the entire class. Many of these lessons can be made to appear completely different by changing the story and/or the numbers in the story. Lessons which you may wish to repeat include:

F1	Cats and Mice
F2.1	Numerical Activity #1
F2.2	Bedtime for Birds
F3	Numerical Activity #2
F4	One to One Correspondence
F5	Numerical Activity #3

The following game activities may be appropriate for students whose numerical readiness is weak.

Numeral Card Game

One student chooses a numeral card (showing one of the numerals from "0" to "10") and shows it to a second student. The second student should tap that many times. If the second student taps the number correctly, he or she may choose the next numeral card. If a mistake is made, the student who spots the mistake chooses next.

Some variations of this activity are the following:

- The second student should read the numeral from the card and then point to it on the number line.
- Play the game using all of the numeral cards in the deck,
- All the students in the group, one at a time, should tap the number, with each student trying to tap in an interesting pattern. For

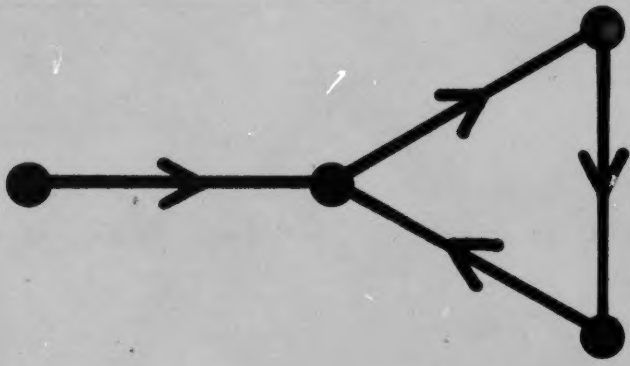
110

example, here are several possible patterns for 5.

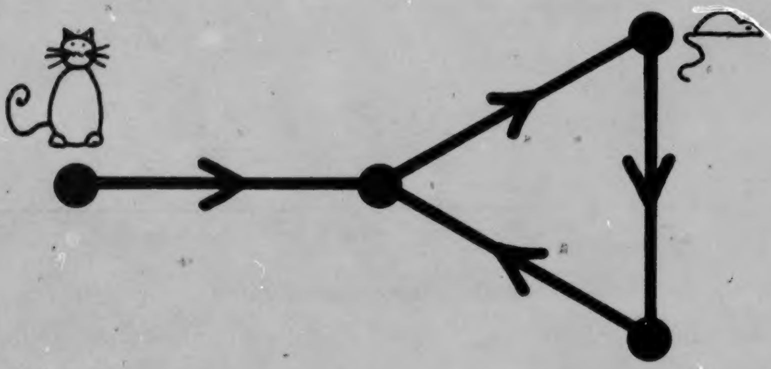
tap, tap, tap, tap, tap
tap, tap . . . tap, tap, tap
tap . . . tap, tap, tap, tap
tap, TAP, tap, TAP, tap

Cat and Mouse Game

Draw this arrow picture on the board.



Have small pictures of a cat and a mouse handy, with a loop of tape on the back of each picture so that each can be attached to the board. Place the cat and mouse into the picture as shown.



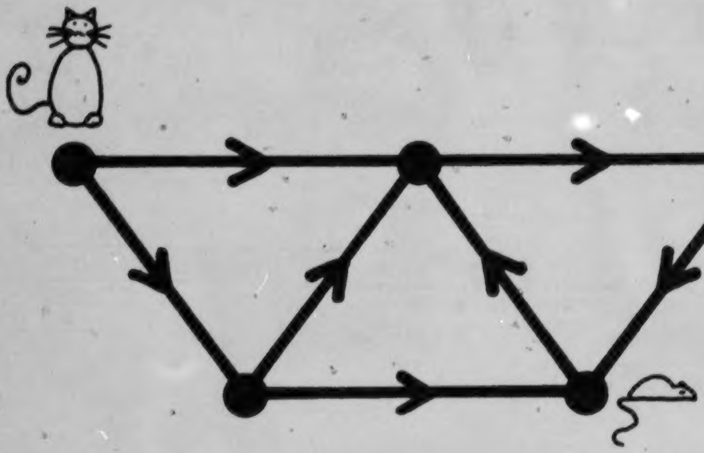
T: The cat and mouse can only run from dot to dot in the direction of the arrows. As they are now placed, can the cat get to the mouse? Show me how the cat might reach the mouse.

Allow the student to trace the path from the cat to the mouse.

T: Try to put the cat and mouse in places so that the mouse will be safe.

When the student has placed both the cat and mouse, check these new positions by asking if there is still a path by which the cat might reach the mouse. Continue until the mouse is safe.

This activity may be varied by changing the arrow picture. For example, a more sophisticated game would result from the following arrow picture.



Counting Songs

Counting songs such as "Ten Little Indians " and "Ten Green Frogs " are fun to sing. When the students have learned the songs, you can suggest, for variety, that the numbers be changed. For example, try singing "Ten Little Indians ", starting with 2 and counting only even numbers ("Two little, four little, six little Indians, . . . ").

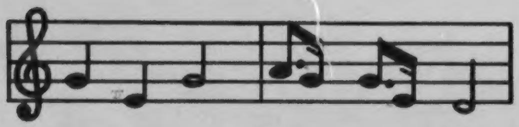
F 10

"Ten Little Indians"

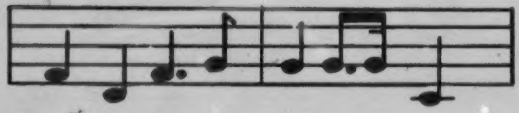
One little, two little, three little Indians,
Four little, five little, six little Indians,
Seven little, eight little, nine little Indians,
Ten little Indian boys.

Ten little, nine little, eight little Indians,
Seven little, six little, five little Indians,
Four little, three little, two little Indians,
One little Indian boy.

"Ten Green Frogs"



Ten green frogs swimming in the pond.



One got out, and then there were nine.

Nine green frogs swimming in the pond.
One got out and then there were _______. (Eight)

Eight green frogs swimming in the pond.
One got out and then there were _______. (Seven)

(And so on)

EARLY WARNING !

Among the next nine classroom lessons are some which require extra preparation time, or which involve materials not included with the CSMP classroom set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (These special materials have been listed here only once, even if they are needed more than once during the nine-day period.)

F11.1 Numerical Activity #4: magnetic board

F12 Introduction to A-Blocks #1: a container for each student (to store the student's A-Blocks)

F13 "I Am Taller Than You . . . ": pointer

F16.1 Rhythms and Patterns: tapping device

F18.1 Hidden Dots #1: large sheet of paper (to hide dots)

F 11

F11.1 Numerical Activity #4

CAPSULE LESSON SUMMARY

Do some counting exercises to associate a numeral with a number of objects and to write number stories.

MATERIALS

Teacher: Colored chalk; magnetic board; magnetic checkers
Student: None

DESCRIPTION OF LESSON

Exercise 1: Finger Games

Ask the students to show six fingers; show six fingers another way; and show six fingers yet another way.

Ask the students to show four fingers on one hand and three fingers on the other.

T: How many fingers are shown all together?

Choose two students. Together, they are to show nine fingers. Let them decide how to solve the problem. Afterwards, ask if it is necessary to have two students to be able to show nine fingers. Proceed in a similar fashion for 12 fingers.

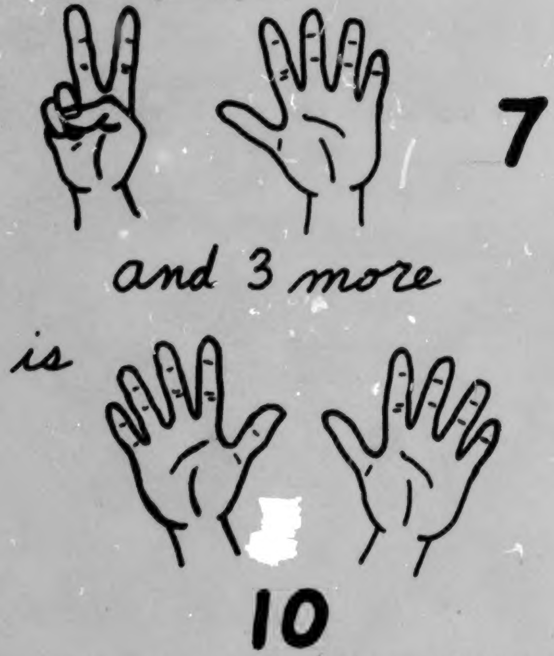
Exercise 2: Fingers - Combinations to Make 10

T: Show me seven fingers.

When this has been done, you show seven fingers and ask:

T: How many more fingers do you need to show ten fingers all together? (Three) Yes, seven and three more is ten.

Show this on your fingers as you say it.



Repeat the fact several times, each time using your hands to illustrate it. Write "7 + 3 = 10" on the board but do not stress the written number story.

Repeat this exercise starting with six, eight, or nine fingers. Ask:

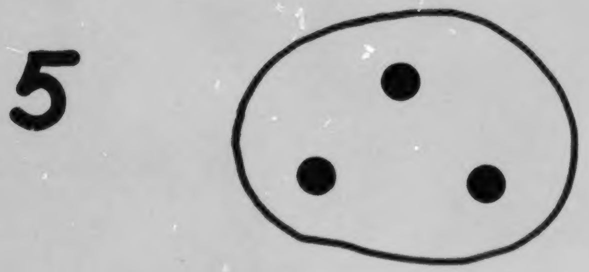
T: How many more fingers do you need to show ten fingers all together?

(You may want to practice some finger illustrations before the lesson.)

Exercise 3: Happy Fish

T: One of my friends owns a pet shop which specializes in all kinds of fish. As you know, fish need to have lots of water and swimming room if they are to be healthy and happy. So, my friend is very concerned about how many fish there are in each bowl. He has decided that there should be exactly five fish in each bowl. (Write "5" on the board.) There is only one problem. My friend has a niece, Jody. She loves to help him clean out the bowls and change the water. . . but she can't count very well. Look, here is the first bowl she cleaned yesterday.

Draw a string, place magnetic checkers in it (if this is not possible, draw dots instead), and write "5" near the string.



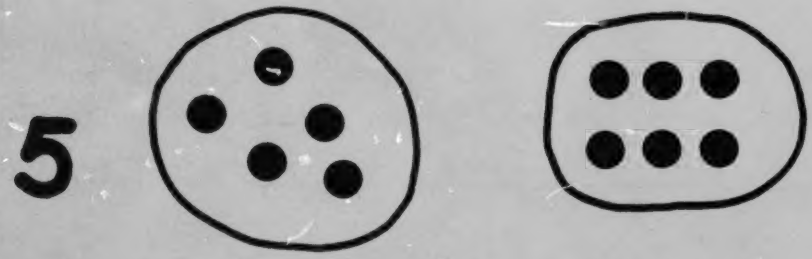
The students will probably notice that this bowl doesn't contain five fish. Ask them if they can help Jody. If necessary, ask questions such as:

T: How many fish are there in this bowl? (Three)
Is that too much or not enough? (Not enough)
What should Jody do? (Add two fish)

Place two more checkers (or draw two more dots) inside the string. Write "3 + 2 = 5" on the board.

T: Three plus two is five.

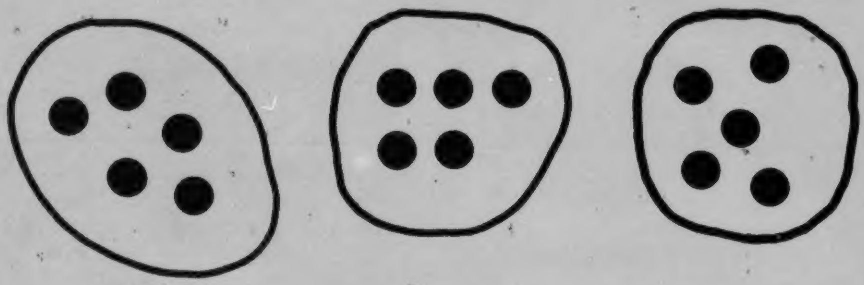
When this has been done, draw a second string.



T: Here is a second bowl. What do you think about this one?

S: There are too many fish. One should be taken out.

When this has been done, draw a third string.



S: There are five fish in this bowl. That's okay.

To correct a mistake, ask a student to count the checkers in the string being discussed.

Repeat this activity several times with different numbers of fish.

F11.2 The Mailman #1: Distributing Birthday Cards

CAPSULE LESSON SUMMARY

Inside a string draw dots for birthday cards. Inside a second string, draw dots for children. Use arrows to show to which children the cards were delivered. For each child, draw a string around all the cards he or she received.

MATERIALS

Teacher: Colored chalk

Student: Paper; colored pencils, pens, or crayons

DESCRIPTION OF LESSON

T: How many of you have a birthday this month?
How do you celebrate your birthday?

Let several students respond. If no one mentions birthday cards, ask:

T: Do you receive birthday cards?

S: Yes.

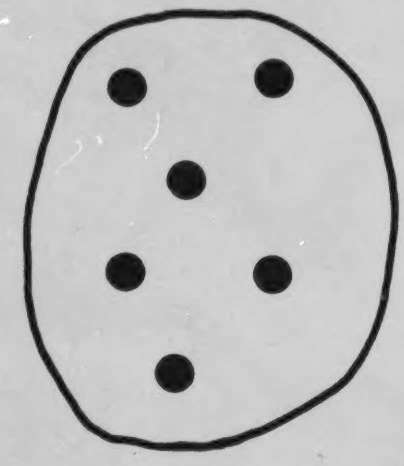
T: Who brings them?

S: The mailman.

T: This is a story about a mailman who delivers the mail to a street on which several children live. Not all the children have their birthdays this month, but a few of them received cards this morning.

Here are the cards the mailman brought.

Draw this string picture on the left side of your board.



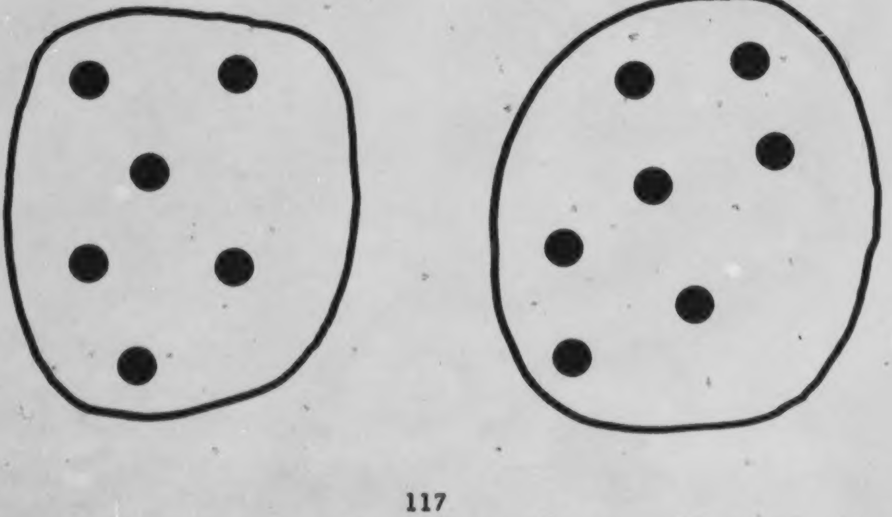
T: How many cards? (Six)

The mailman gave the cards to some of the children who live on that street.

Here are the children.

Complete the picture.

NOTE: Draw the strings far enough apart that you can draw arrows with arrowheads in the space between the strings.



F 11

T: How many children? (Seven)

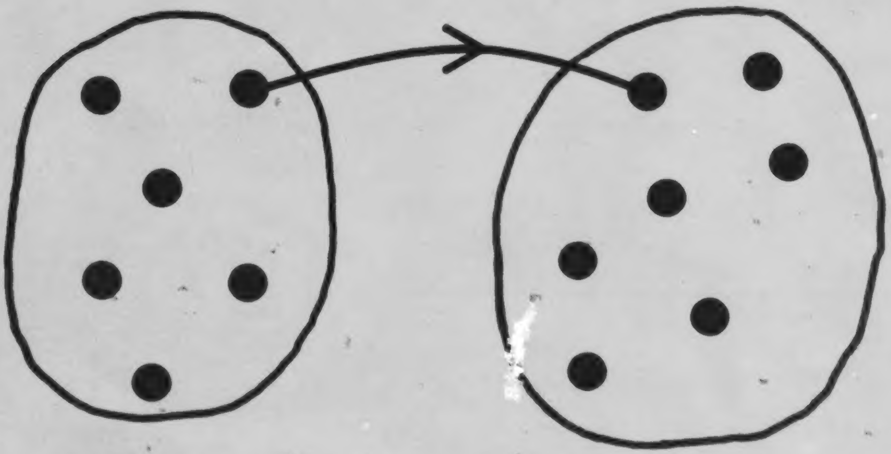
Bill (substitute the name of a student in the class who has a birthday this month, if there is one) lives on that street.

T: Here is Bill (point to a dot in the blue string).

How could we show that this card (point to a dot in the red string) is for Bill?

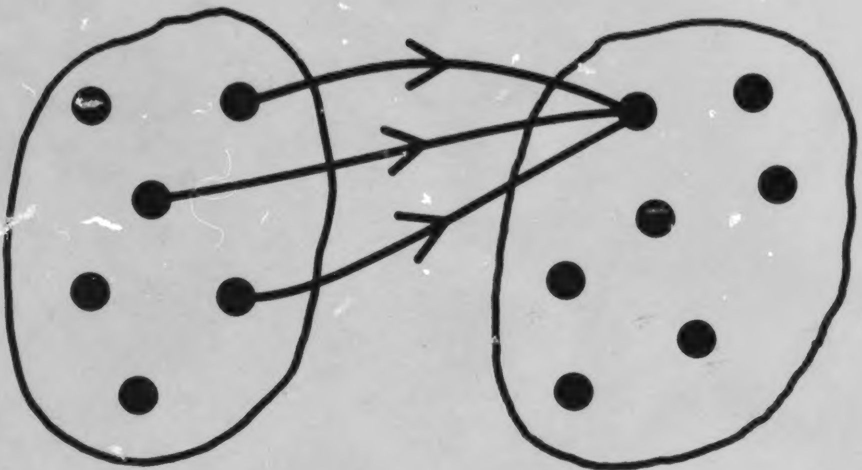
S: Use an arrow.

Draw an arrow with green chalk.



T: Do you think Bill received only one card? Let's see.

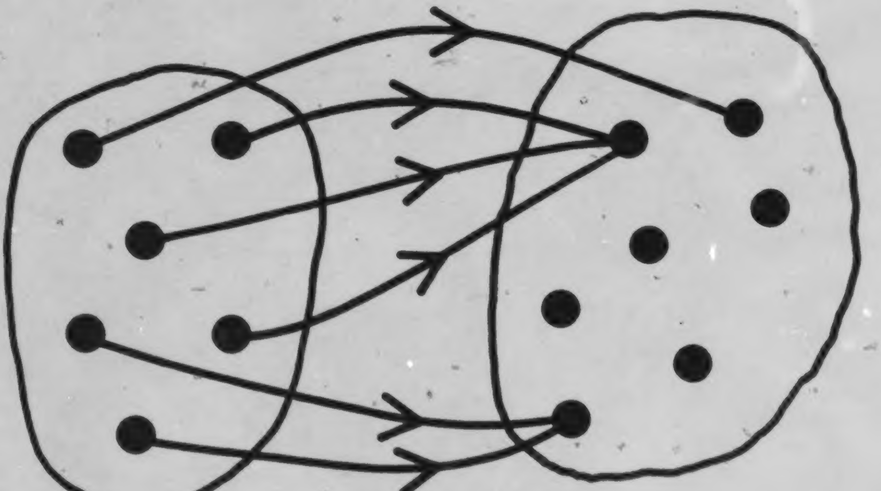
Draw two more arrows.



T: How many cards did Bill receive? (Three)

The mailman has more cards to deliver. How many more? (Three)

Here is how he gave them out.



F 11

T: How many children received cards? (Three)

How many cards did Bill receive? (Three)

Who can point to them?

Let's draw a yellow string around Bill's cards.

T: How many cards did this child (point to the dot at the bottom of the blue string) receive? (Two)

Who can point to them?

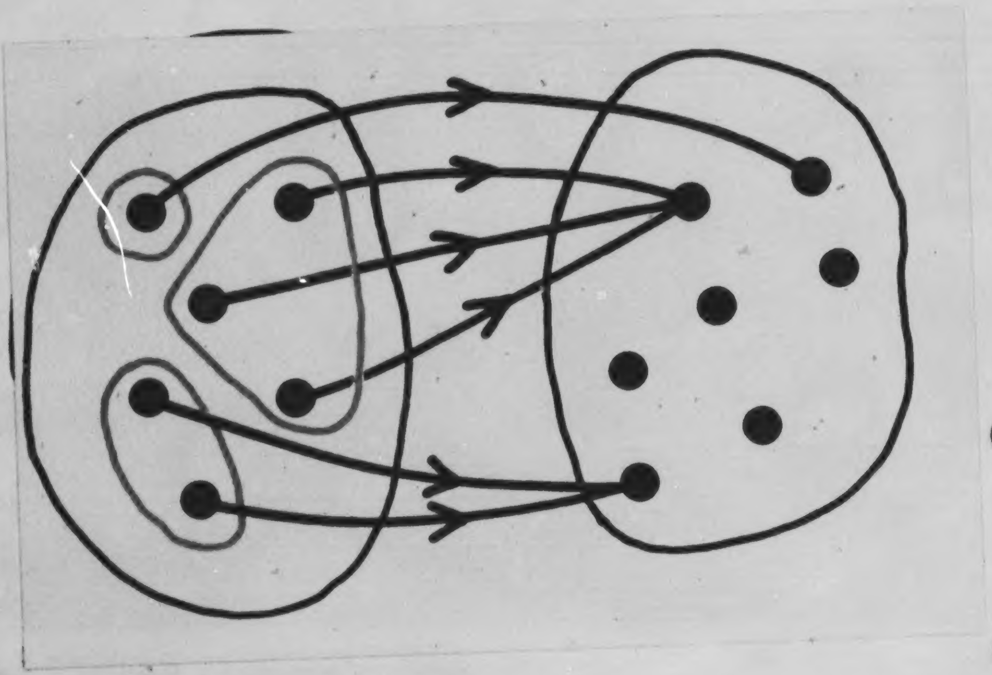
Let's draw a yellow string around them.

How many cards did this child (point to the dot at the top of the blue string) receive? (One)

Who can point to it?

Let's draw a yellow string around it.

A completed drawing is shown below.



T: How many children did not receive cards? (Four)

They didn't receive any cards because their birthday is not this month.

Distribute unlined paper. Have the students draw five black dots in one string. These are for birthday cards. Have them draw six dots, for children, in another string. Suggest they deliver the cards as they wish. Those who finish quickly should draw the picture for another story in which each child receives at least one card.

F 12

F12 Introduction to A-Blocks #1

CAPSULE LESSON SUMMARY

Display A-blocks and examine the different attributes of the blocks.

Locate certain A-blocks from a description of their various attributes.

MATERIALS

Teacher: One set of A-Blocks

Student: One set of A-Blocks for each student; a container (to store the A-Blocks)

NOTE: A-Blocks may be replaced with any kind of attribute blocks, as long as they have at least three attributes (color, shape and size).

DESCRIPTION OF LESSON

Show the students one of your A-block pieces.

S: It's a circle.

S: It's yellow.

Don't ask for more attributes than those the students suggest. Show another A-block piece.

S: A red square.

Continue in this manner. Be sure to include a triangle.

Distribute the A-blocks to the students and let them punch them out and play with them as they wish. For instance, they might sort them out or make designs or patterns. Praise any creative idea.

If your students start to lose interest in free play, direct them to more structured activities. For example, T: Put all the pieces in the middle of your desk. Without making any noise, hold up the piece I ask for. Pay attention! First listen. Then, when I give the signal, pick it up.

T: A little triangle. Go!
A red circle. Go!
A blue square. Go!
A little red triangle. Go!
A big blue square. Go!

A complete attribute block set consists of 24 pieces. There is exactly one piece for each possible combination of the attributes (size, color, shape). For example, one A-block piece is a big red circle.

$$\begin{bmatrix}\text{big}\\ \text{or}\\ \text{little}\end{bmatrix} \qquad \begin{bmatrix}\text{square}\\ \text{or}\\ \text{circle}\\ \text{or}\\ \text{triangle}\end{bmatrix} \qquad \begin{bmatrix}\text{blue}\\ \text{or}\\ \text{red}\\ \text{or}\\ \text{green}\\ \text{or}\\ \text{yellow}\end{bmatrix}$$

Before putting the A-blocks away, have the students sort them by color or by shape, so you can check to see that each set is complete.

F 13

F13 "I Am Taller Than You" and "I Am Shorter Than You"

CAPSULE LESSON SUMMARY

Draw dots for four children in your class. Complete an arrow picture using different color arrows for "I am taller than you" and "I am shorter than you". Let the students draw "I am taller than you" arrow pictures of their families.

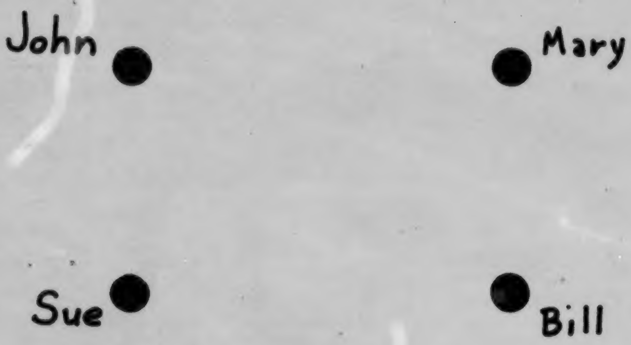
MATERIALS

Teacher: Colored chalk, pointer
Student: Paper; colored pencils, pens, or crayons

DESCRIPTION OF LESSON

Call four students to the front of the room and draw a dot diagram of their positions. Write the appropriate name beside each dot. Explain that they are going to play a game.

NOTE: Use your judgment concerning the choice of students to participate in this game. Some may not be happy about being the tallest or the shortest. However, you should try to pick four students with fairly obvious height differences.



T: This game is called "I Am Taller Than You".

Pick one of the students, not the tallest or shortest, and ask:

T: Mary, can you speak to someone in this game?

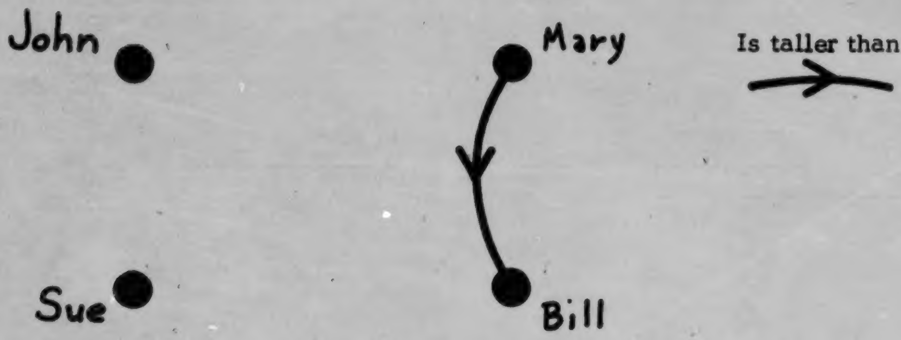
S: Bill.

T: Can Mary speak to Bill?

Stand Mary and Bill back to back to let the class see if Mary really is taller than Bill.

If Mary was correct, let her point to Bill and say: "I am taller than you."

Let some one trace an arrow in the picture to show "Mary is taller than Bill"; draw the arrow yourself.

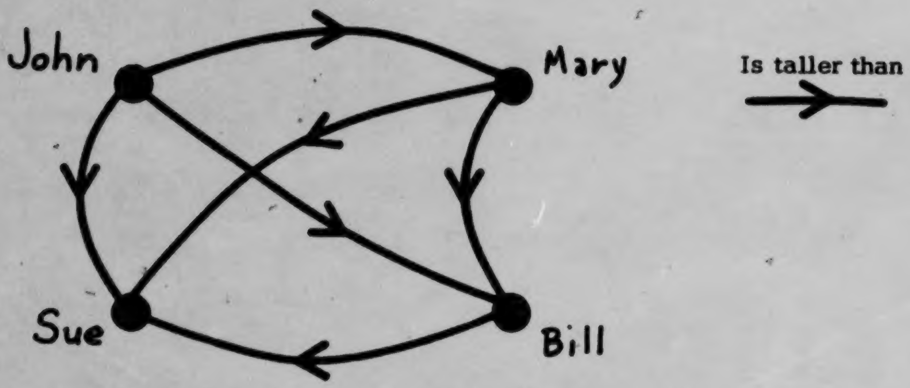


T: Is there anyone else that Mary can talk to?

Continue until all of Mary's possibilities have been tested to the satisfaction of the class. Let Mary point to whomever she can and say: "I am taller than you." As Mary points, you may want to let another student use a pointer to trace the corresponding arrows in the picture on the board.

F 13

Do the same for one of the other three students. Continue in this manner until all the "I am taller than you" arrows have been drawn. Your picture might look like this when complete.



When this part of the picture is finished, ask the four students to point to whomever they should. John will have to use his foot (or his head) to point to someone.

T: Who gets to talk the most? (John)
How can you tell that by looking at the picture?

S: John gets to talk to everyone else.

S: There are three red arrows starting at John.

T: Who is the shortest person in the picture? (Sue)
How can you tell that from looking at the picture?

S: There are no red arrows starting at Sue.

S: She doesn't talk.

S: There are three arrows ending at Sue, so she is the shortest.

T: Can you imagine a game with the same people in which Sue can talk?

S: "I am shorter than you".

If no one offers this response, ask John what he can say to Sue. Then, ask Sue what she could answer.

T: Let's play "I Am Shorter Than You" in blue on this picture.

Point to the picture on the board (but do not call the four students to the front of the room again).

T: Who sees a place to draw a blue arrow?

Let a student trace the arrow with the pointer or his finger. If it is correct, draw the arrow.

T: How do you know it is correct to draw a blue arrow there?

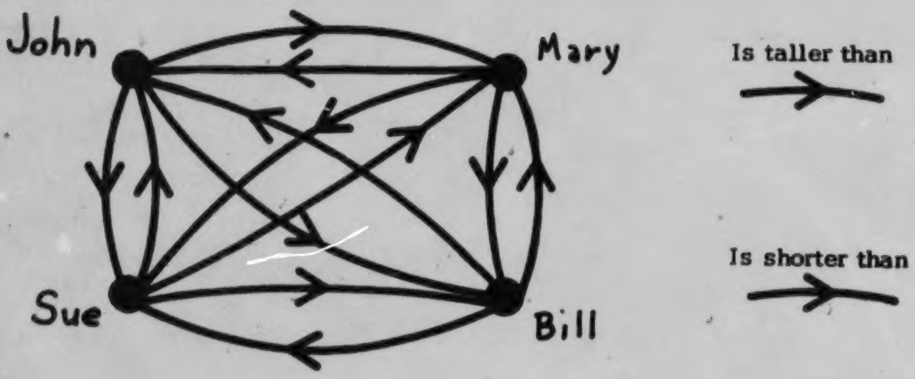
S: Sue is shorter than John.

S: In the last game, John was taller than Sue---so Sue is shorter than John.

S: The red arrow shows John is taller than Sue, so Sue can talk to John and say "I am shorter than you".

Ask for other blue arrows, until the picture is finished.

F13



T: Who talks the most when we play "I Am Shorter Than You"? (Sue)
How can you tell?

S: There are three blue arrows starting at Sue.

S: She talks to all the others in blue.

S: She's the shortest.

T: Who talks the least in blue? (John)
How can you tell?

S: He's the tallest.

S: There are no blue arrows starting at him.

Initially, the explanations given may be incomplete, or only partially appropriate. Accept any explanation, rephrasing it with the appropriate part or completing it yourself, if necessary. Gradually the children will get better at verbalizing their responses.

Distribute unlined paper and have the students draw "taller than" pictures for their respective families. They should use one dot for each family member and then draw the red arrows. Students with small families may want to put in a dot for an aunt or a grandfather or a pet. Those with large families may want to consider only brothers or sisters. Don't worry if not all the arrows are drawn.

Students who finish early should add "shorter than" arrows.

F 14

F14 "81 Roses"

CAPSULE LESSON SUMMARY

Read the story "81 Roses" and discuss the meaning of the string pictures and the arrow pictures in this story.

MATERIALS

Teacher: One copy of the storybook, "81 Roses"

Student: One copy of the storybook, "81 Roses", for each pair of students

DESCRIPTION OF LESSON

Although "81 Roses" uses the mathematical languages of strings and arrows, it is really a story in the true sense of the word. And that's how it should be read to your class. Forget that the book is part of a mathematical curriculum.

You may wonder why this storybook (among others) is included in our curriculum. Part of the reason is that it is our intention to leave the students with the impression that these mathematical languages are powerful, useful, and as natural as their own mother tongue. On the other hand, we believe that there is room in the world of mathematics for expressing the emotions and for giving free rein to children's wonderful imagination.

We suggest that, for this particular book, you do not give your students copies of the book right at the beginning of the lesson. Experience has shown this to be more distracting than useful. However, as you are reading the story, give the students an opportunity to look at the realistic pictures in the book by holding up your own copy for them to see at the appropriate moment. If, on the other hand, you wish them to focus on a particular picture, it is very easy to copy it onto the board.

Here are some suggested questions you may wish to introduce as you are reading the story. (If you do this, be careful not to destroy the atmosphere of the story.)

page 7:

T: The blue arrow tells you that the dog is following his mother. Point to the dog. Point to the mother.

page 9:

T: How many dots are there in the blue string? Who are they for?

page 13:

T: Can you find the number 37 on this page? What are the other numbers?

pages 14-15:

Ask the students to count the cookies, then to point to the stolen cookies and count how many cookies are left over. You could ask them to illustrate this part of the story with their fingers.

page 15 or page 19:

This would be a good place to stop the story if you feel it is too long for your class to take at one sitting. You can always finish reading it another time. If you break the reading of this story into two sessions, before you start reading on the second occasion, ask the students what they remember about the story from the first session. It would be a good idea to finish the story later in the same day.

page 20:

Ask a student to point to the mother and to the dogs.

page 21:

Ask a student to point to the mother and to the little dog.

page 22:

T: How many dots are there in the blue string? Who are they for?

page 24:

T: Do you have any idea how old the little dog's mother is now?

If nobody knows, tell the students to pay close attention as you continue to read the story, so that they can find out.

When you have finished reading the story, don't rush the students into another activity. Instead, give a copy of the storybook to each pair of students and let them look at the pictures at their own pace. Make them feel free to talk about the story (with you or with their partner), or to make a drawing about it if they wish. Your students would enjoy it greatly if they were able to have a copy of the storybook to keep. This can be arranged if your school is prepared to buy sufficient additional copies of the book so that you have one copy for each student. However, if it is not the intention of your school to purchase a new set of storybooks each year, once your students have had ample opportunity to look through the book, collect them so that they can be reused next year.

There is a narration tape[*] available for the story "81 Roses". On some other occasion, you could listen to it as a class, or you could let the students listen to it individually at any time during the year. In any case, at least one copy of this storybook (with or without the accompanying tape) should be available for students who wish to look at it in their spare time.

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[*] This tape may be obtained by sending a blank 30-minute cassette tape to CEMREL-CSMP. The recorded tape will be returned to you free of charge. Please be sure to mention the title of this story in your request for the tape to be recorded, and include a stamped, self-addressed envelope.

F15.1 Brother-Sister Graph #1

CAPSULE LESSON SUMMARY

Draw a number of dots for children on a playground, and draw arrows for "I point to my sister". Use the arrow picture to examine which dots are for boys and which are for girls.

MATERIALS

Teacher: Colored chalk; pointer

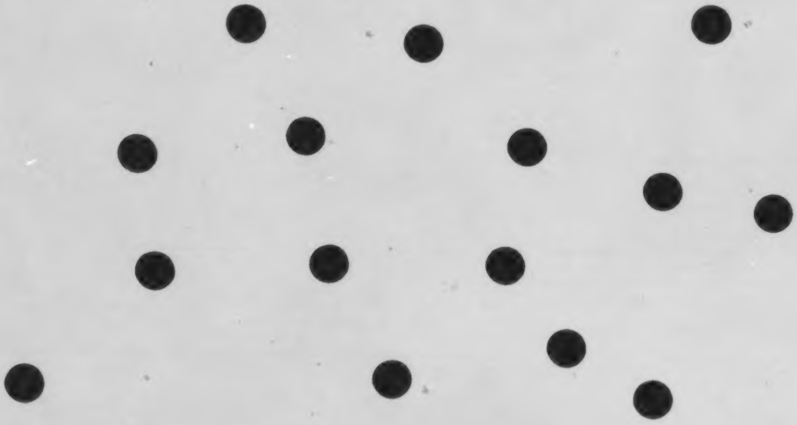
Student: None

DESCRIPTION OF LESSON

NOTE: It is very important to draw a large, very clear arrow picture. Space the dots well apart, and draw long arrows. Follow the layout of the dots and arrows as it appears in this lesson description. Be patient. Don't expect all of the students to understand the entire lesson. There will be other lessons on this idea. Also, you may want to use an easel pad with the pictures already drawn to avoid any lag in the lesson as you complete the drawing.

T: Show me with your fingers how many brothers you have.
Show me how many sisters you have.

Draw this picture on your board.



F 15

T: These are children on a playground. Some are boys and some are girls. Who would like to come up and count them?

Let several students come up and count, pointing to each dot with a pointer or yardstick.

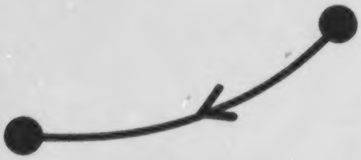
T: There are 15 children. Can we be sure which ones are boys and which are girls?

There should be general agreement that since all the dots are similar, there is no way to tell.

T: The children have played a game which might help us tell some of the boys from some of the girls. They have played the game "I Point to my Sister".

Draw one of the blue arrows from the completed picture and say:

T: This child (point to the starting dot) says "I am pointing to my sister".



T: Can you see a girl in our picture?

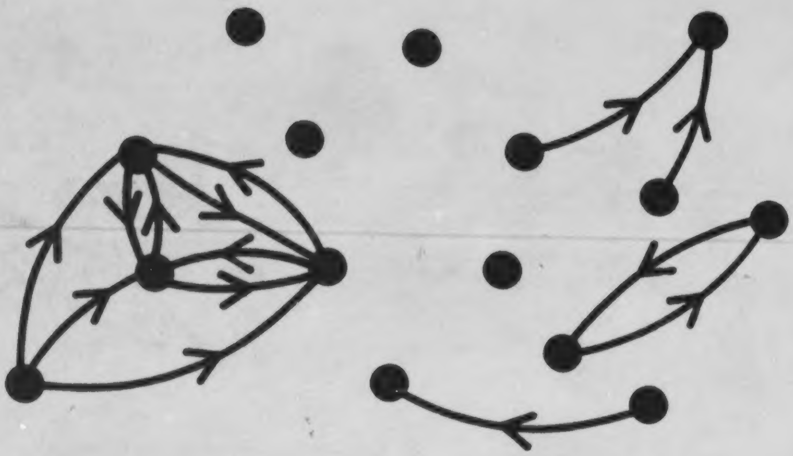
S: The dot on the left.

T: How do you know?

S: Because the arrow ends there.

S: She is someone's sister.

Complete your drawing.

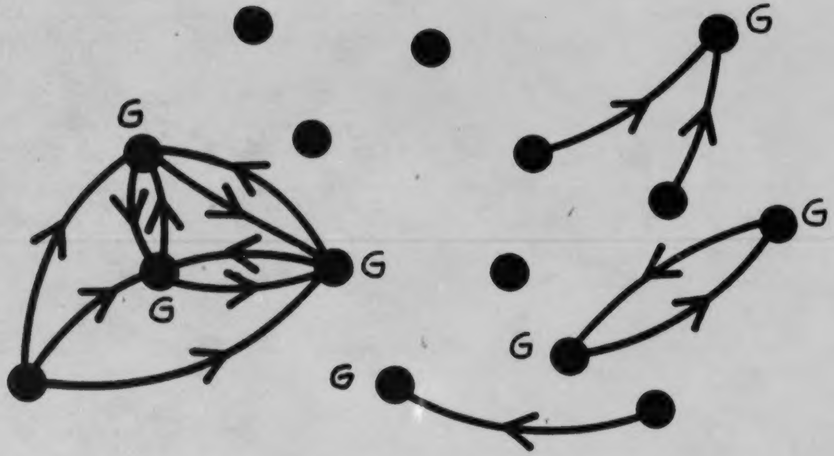


T: The children have played their game. I have drawn all the blue arrows. Can someone point to a girl?

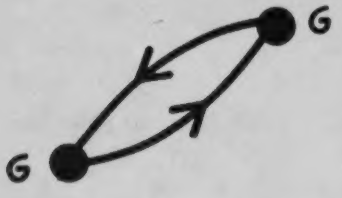
Let the students come up and point out which children must be girls, according to the arrow picture. If a student makes a mistake, let another student explain it.

You may find it helpful to write "G" next to the dots for girls as they are discovered.

From the arrow picture, it is possible to deduce that seven dots represent girls. If your students lose interest in the problem before finding all seven girls, just proceed with the lesson. There will be other opportunities to finish the problem.



Draw the attention of the class to this part of the picture.

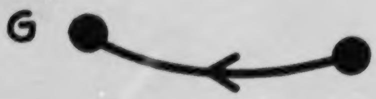


T: How are these children related?

S: They are sisters.

Have two girls come to the front of the class, pretend they are sisters, and act out this part of the diagram (by pointing to each other and saying "I am pointing to my sister").

Next, draw the attention of the class to this part of the picture.



T: Remember I told you, in the beginning, that all the blue arrows were drawn. What do we know about these two children?

If a student answers that the two children are sisters, have two girls act out the parts. The students will see that since there is no return arrow in blue, they can't be sisters.

S: That child says "I am pointing to my sister."

T: This, then, is the sister (point to the dot on the left). What about the other dot?

S: Her brother!

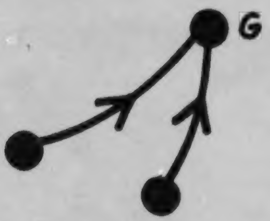
Have a boy and a girl act out the situation.

T: Now we know that this is a boy (point to the dot on the right). Are there any other dots which we know are for boys?

Your class may not be ready for this. If they do not respond, end the lesson here.

F 15

If they discover the two boys in this part of the arrow picture. . .



. . . ask,

T: Who knows how these two boys are related?

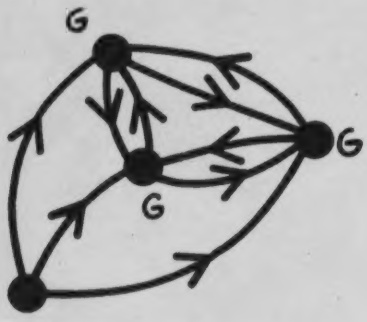
S: They are brothers.

T: We have found three boys. Are there any other dots which must be for boys?

There is one (see answer key on p.139). If your students find it, point to it and say:

T: Right. This is a boy. How many sisters does he have on the playground? (Three)

If your students do not find the last boy, direct their attention to this part of the picture.

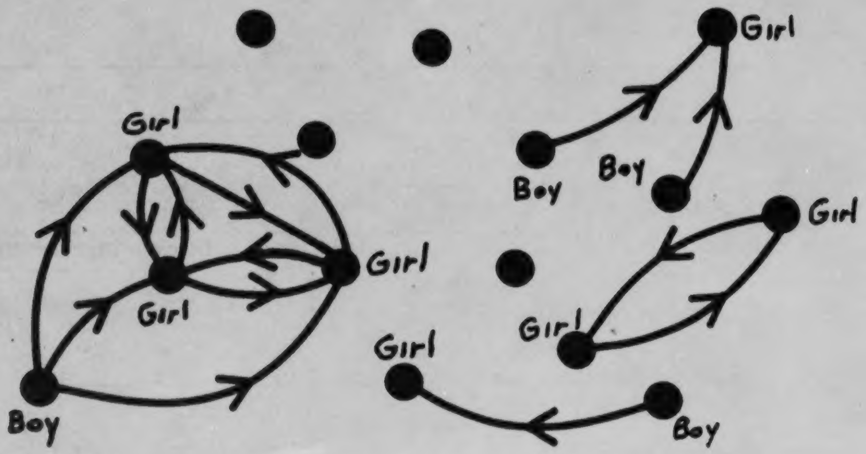


141

T: How are these four children related?

S: Three sisters and one brother.

Answer Key


Girl
Girl
Girl
Boy
Girl
Boy
Boy
Girl
Girl
Girl
Boy

From the arrow picture, it is impossible to know if the other four dots are boys or girls.

F15.2 Numerical Activity #5

CAPSULE LESSON SUMMARY

Associate a numeral with a number of dots and practice writing numerals.

MATERIALS

Teacher: None

Student: Worksheets F15.2*, **, ***, and ****.

DESCRIPTION OF LESSON

Distribute Worksheets F15.2* and **. Explain to the students that they should count only the black dots in each line of dots and put that number in the blank. Ask them to find each number on their number line before they write it on their paper.

Students who complete these two worksheets should be given worksheets F15.2*** and ****.

Name ______________ F 15.2 *

Count the black dots.

● ● ○ ● ● ● ○	5
● ● ○ ○ ○ ○ ○	2
○ ● ● ● ● ● ○	5
○ ● ○ ● ○ ● ○	3
● ○ ● ○ ● ○ ●	4
○ ○ ○ ● ○ ● ○	2
○ ○ ○ ● ● ● ●	4
● ● ● ○ ○ ● ●	5

Name ______________ F 15.2 **

Count the black dots.

●●●●●	○○○○○	5
●●●●●	●●●○○	8
●●●●○	●●●○○	7
○○○○○	●●●●●	5
●○○○○	●●●●●	6
●●○○○	●●●●●	7
●●●●○	○●●●●	8
●●●●●	●●●●●	10

Name ______________ F 15.2 ***

Count the black dots.

●●●●●	●●●●●	●●●●●	15
●●●●●	●●●●●	●●●●○	14
○●○●○	●●●●○	○○○○○	6
●●○●●	●●○●●	●●○●●	12
●●●●●	●●●●●	○○○○○	10
●●●●●	●○●○●	●●●●●	13
●○●○●	●○●○●	●○●○●	9
○●○●○	○●○●○	○●○●○	6
○●○●○	●○●○●	○●○●○	7

Name ______________ F 15.2 ****

Count the black dots.

●●●●● ●●●●●	●●○●● ●○●○●	17
●●●●● ●●●●●	●●●●● ●●●●○	19
●●●●● ●●○●●	●●○●● ●●●●●	18
●●●●○ ●●●○●	●●○●● ●○●●●	16
●●●●● ●●●●●	●●●●● ●●●●●	20

F16

F16.1 Rhythms and Patterns

CAPSULE LESSON SUMMARY

Associate a pattern of dots with a pattern of tapping sounds and use these patterns to explore different representations of numbers. Listen and mimic patterns of taps.

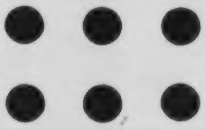
MATERIALS

Teacher: Colored chalk; tapping device such as a pen or a pointer
Student: None

DESCRIPTION OF LESSON

Exercise 1

Draw the following dot pattern on the board.



T: How many dots? (Six)

Ask the class to be very quiet and pay close attention. Use a ball point pen, chalk, stick or other device with which to tap. You should produce nice, sharp noises when you tap.

When your classroom is very quiet, tap three quick taps - then pause - then three more quick taps.

tap, tap, tap -- tap, tap, tap

It is essential that you tap in two groups of three taps.

T: How many? (Six)

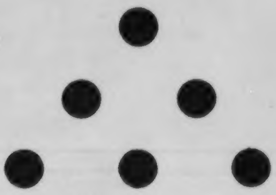
If the students do not answer correctly, repeat and have them pay close attention. Do not be concerned or surprised if you have to try this several times before you get a correct answer.

Then try another tapping pattern; two quick taps - a pause - then four quick taps.

tap, tap -- tap, tap, tap, tap

T: How many? (Six)

Next to the other dot pattern on the board, draw the following dot pattern in green.



Tap this pattern: one tap - pause - two taps - pause - three taps.

tap -- tap, tap -- tap, tap, tap

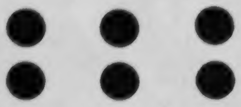
T: How many? (Six)
Which picture was I tapping (Green)

The students may not understand the question. If not, tap again in a one - pause - two - pause - three pattern and say:

T: Did that sound like the red picture or the green?

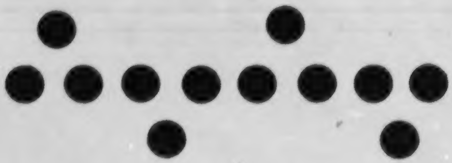
If several tries do not produce the correct answer, tap in the same rhythm hitting a dot on each tap (the top dot - tap - step back - the middle dots - tap, tap - step back - the bottom dots - tap, tap, tap).

If this is going well, you could tap in a "two-two-two" pattern and ask which picture goes with the tapping. In this case you are thinking about the red picture.



Exercise 2

Erase the pictures you have drawn so far. Draw this design of dots on the dot board.



T: What color am I going to use for the next dot?

Continue asking "What color next?" until you have 18 or 21 dots.

T: Do you see a nice pattern in these dots?

S: There are three red and three blue and three red and three blue . . . and so on.

Point to the dots as a student or you say this. Add an inflection to your voice to emphasize the repetition in the pattern: three red, three blue -- three red, three blue -- and so on.

Tap this pattern for the children.

tap, tap, tap - pause - tap, tap, tap - pause - tap, tap, tap - pause - tap, tap, tap - pause - tap, tap, tap - pause - tap, tap, tap

T: Who would like to tap this pattern?

If a student is incorrect, repeat the pattern correctly before having another student attempt the tapping.

Exercise 3

Erase the board.

This time, you are tapping a rhythm rather than a visible pattern. The students are to discover, after listening, what the rhythm is.

For example, tap in a "three-two" rhythm.

tap, tap, tap - pause - tap, tap - pause - tap, tap, tap - pause - tap, tap - pause - tap, tap, tap - pause - tap, tap.

Then ask who would like to do the same. Again, this is difficult for the students and it will probably take several trials to get a correct imitation of your tapping. Between the students' attempts, repeat the pattern. Be very dramatic - ask for perfect quiet and attention. Accentuate the pattern by tapping more rapidly but with longer pauses between the groups. You might want to use two different tapping devices such as chalk for the "two-taps" and a stick or pencil for the "three-taps".

Repeat with a different pattern if you wish.

F 16

NOTE: The secret to tapping activities seems to be partly in the dramatics. Always demand "pin dropping" silence before tapping. In fact, if your class is especially noisy at some time, use Exercise 3 as a five minute, quieting down device.

Each of the parts in this activity can be used separately at any time.

F16.2 A Counting Snake

CAPSULE LESSON SUMMARY

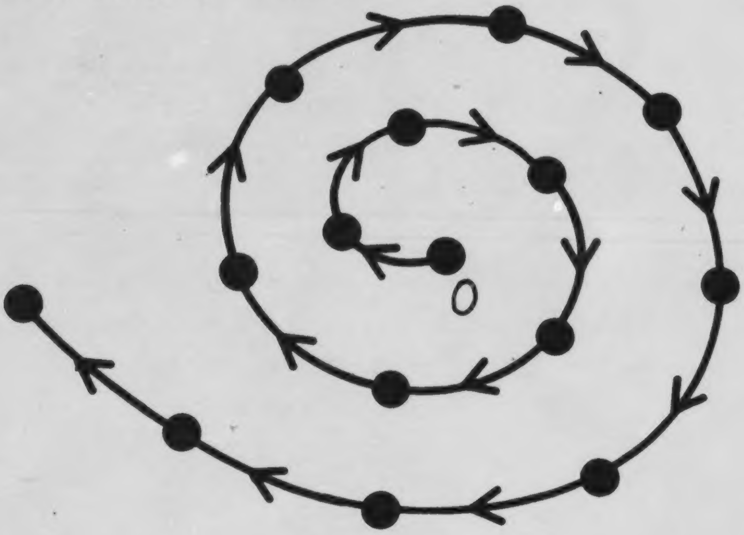
Counting by ones, label the dots of an arrow picture. Use the arrow picture to introduce a numerical relation (+1) and to practice writing the numerals in counting order.

MATERIALS

Teacher: Colored chalk
Student: Worksheet F16.2

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



The arrow picture should be as large as possible and should appear to go off the chalkboard. The exact number of dots is not important. Allow the students to comment on the spiral while you are drawing the arrow picture.

T: These dots are for numbers. This is a counting snake.

F 16

Point to "0".

T: Here is the number 0. When we count by ones, what number comes next after 0? (1)

Write "1" near the appropriate dot.

T: After 1, comes . . . ? (2)
After 2, . . . ? (3)

Continue labeling the dots as you are given the correct number.

When you reach the number 5, don't write any more numbers on the spiral. Point to the succeeding dots and ask the students what numbers they are for.

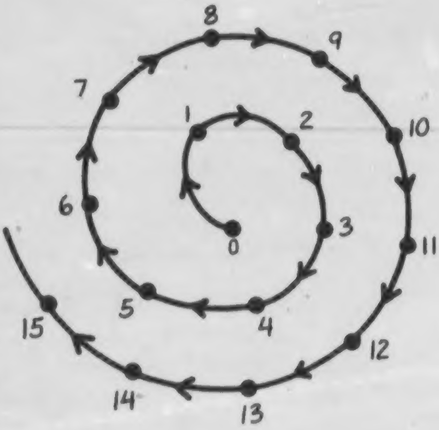
Distribute Worksheet F16.2 and explain to the students that they should label the dots in the counting snake, just as you did on the board. Stress that each dot is for a number and they should put the number as close to the dot as possible.

Students who finish quickly could draw their own spirals on the back of the worksheet. You should give them the first number in their counting snake, varying this number according to each student's ability.

Name ______________________

F16.2

Label the dots.


0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

F 17

F17.1 Fingers

CAPSULE LESSON SUMMARY

Do some finger counting exercises to associate a numeral with a number of objects, to write different names for a number, and to introduce the notion of place value.

MATERIALS

Teacher: Chalk

Student: None

DESCRIPTION OF LESSON

Parts of this lesson, or variations of it should be used often as quick, five minute activities.

Exercise 1: Combinations to make 4, 5, 6, 7, 8, and 9 in different ways

Use each hand for a separate addend whenever possible. The following example is for 7. All finger combinations for 7 can be shown with separate addends on each hand except "6 + 1", "1 + 6", "0 + 7" and "7 + 0".

T: Show me seven fingers. Good. Barbara is showing 7 as "5 + 2".

Write "5 + 2 = 7" on the board.

T: Can anyone show me seven fingers another way?

Make comments on the ways the students show 7 and write each new way on the board. When the students have given you all the ways they can think of, go on to another number.

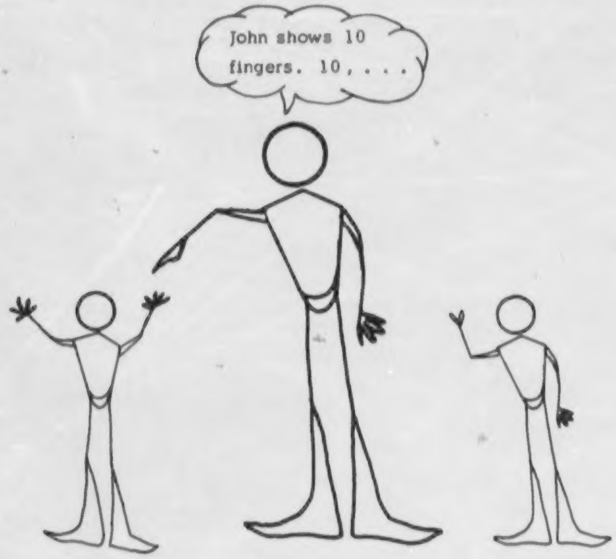
It is not necessary to show all the finger combinations. If you already have, say, "5 + 2 = 7" listed and someone shows you "2 + 5" accept this as a different way and write it on the board also.

Exercise 2

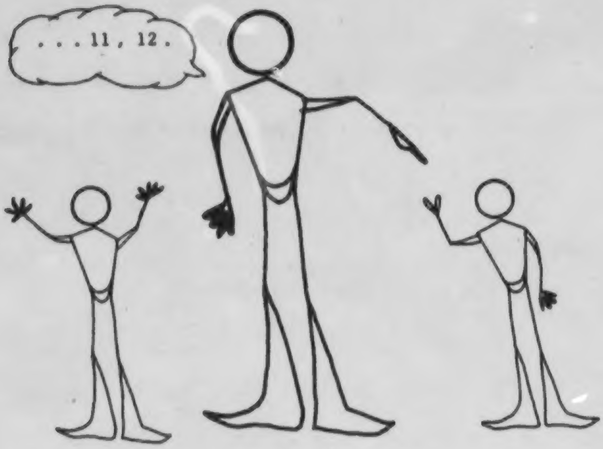
Ask a student to show seven fingers; ask another student to show nine fingers; then ask a student to show 12 fingers. There may be some confusion, but the class should tell you that one person has only ten fingers. Some inventive students may pair themselves to show 12 fingers. Call two students to the front and ask them to show 12 fingers. (You may want to pair off the students in the room and let each pair figure out how they can show 12 fingers.) Allow the students to solve the problem by themselves. If necessary, let them discuss it and count their fingers to find out how to show 12. When this has been done to the satisfaction of each pair of students, ask if the presentation is correct. Count with the class to check. (If you paired off all the students, pick just one pair to count.) If the pair of students is not correct, let someone explain what they need to show. Count again by ones to show it is now correct. Point to each finger as you count.

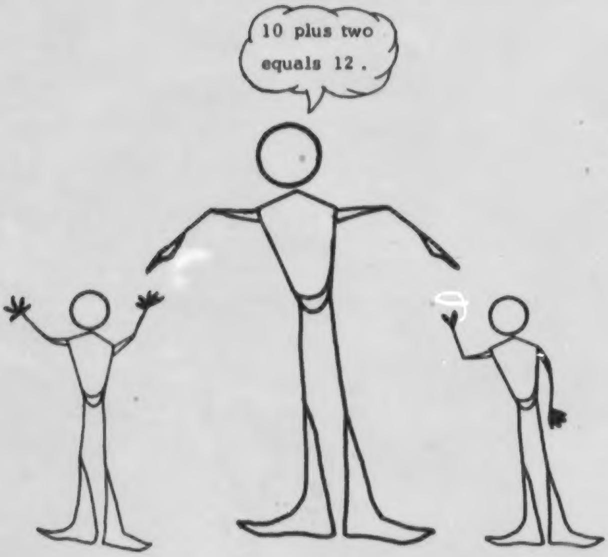
T: Here we have 12 fingers. I know a faster way to count these fingers. How many fingers does John show? (Ten) So I just have to count the two more fingers shown by Sally.

Point to John's tenth finger, then to Sally's fingers.



F 17



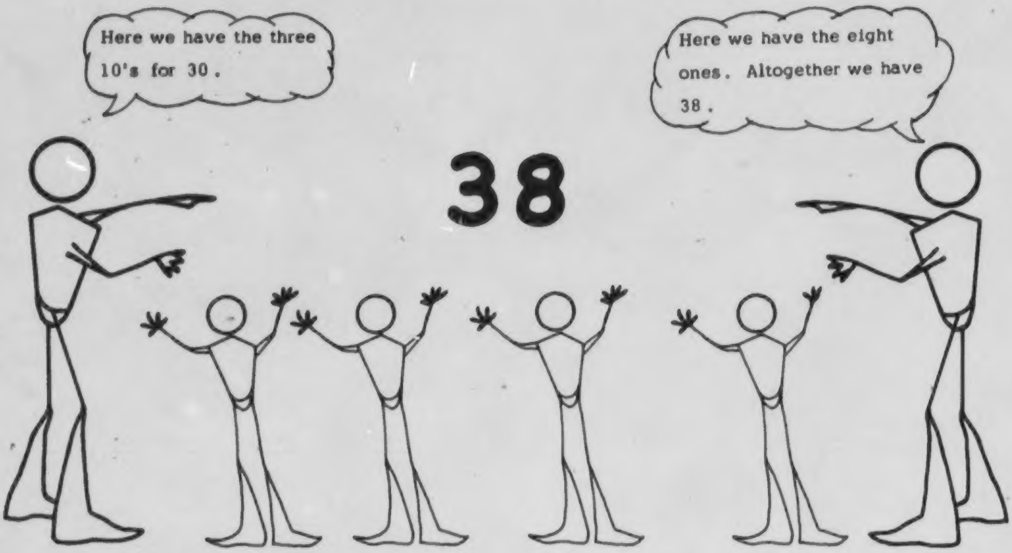


T: 10, 11, 12; 10 plus 2 is 12.

If a pair of students each shows six fingers, compliment them and point out to the class that this also shows 12. Count the fingers with the class if you feel this would be helpful. Say, "6 plus 6 equals 12". You may want to take this opportunity to ask for other ways to show 12.

Exercise 3

In this lesson and future ones of this kind, when the numeral is written on the board, you should let the students stand in groups in front of the digits to emphasize the place value. For example,


Here we have the three 10's for 30.
Here we have the eight ones. Altogether we have 38.
38

Send two students to the board. Ask one student to write a numeral and then ask the second student to read the number. If the student cannot read it, ask another student to help. Have the whole class say the number with you.

If the number is more than 100, select another pair of students and ask one of them to put a number less than 100 on the board.

If the number is less than 100, ask how many students will be needed to show that many fingers. Send the correct number of students to the front of the class and have them show the correct number of fingers.

F 17

If the number is less than 30, count the fingers with the class by ones. Emphasize the "10" and "20" as you count. Then count again by tens and then the extra ones. If the number is more than 30, count by tens and then the extra ones. For example, to count 64 fingers, hold up the first student's hands and say "10", hold up the second student's hands and say "20", and continue until you have said "60". For the last student count each finger by ones: "61", "62", "63", "64".

Try to obtain at least one number of each type (i. e. - more than 100, less than 100, and less than 30). If necessary, ask a student to write a number which is less than 30. If no student can read a number, read it yourself.

F17.2 Goldy #1

CAPSULE LESSON SUMMARY

Use a story situation to introduce the symbols for "less than" and "more than".

MATERIALS

Teacher: None

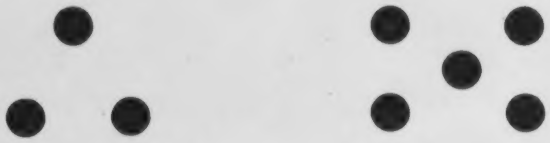
Student: Worksheets F17.2* and **

DESCRIPTION OF LESSON

Tell the following story (making it as imaginative as possible!).

T: Goldy is a very large fish who lives in a very large aquarium with smaller fish. The smaller fish swim together in "schools". Being such a large fish, Goldy gets very hungry and eats the small fish.

Draw the following picture on the board.

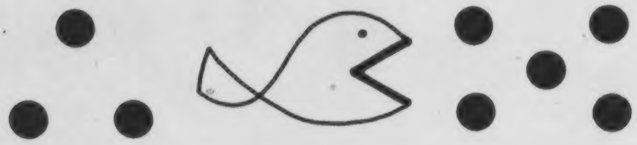


T: The dots are for fish. How many fish are in this school (point to the three dots on the left)?
How many are in this school (point to the five dots on the right)?
If Goldy swims toward one school of fish, the other school swims away. So, if you were Goldy and very hungry, which school would you go after?

Direct the responses so that the school with more fish is always chosen.

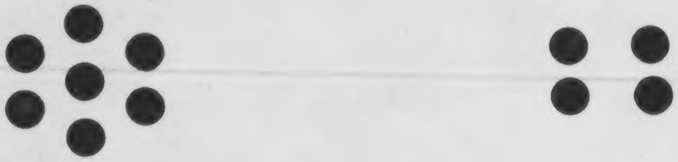
F 17

T: We'll show that Goldy goes after the school with five fish by writing:



Draw Goldy between the schools of fish. Goldy's mouth should be drawn more heavily than the rest of the body.

Now draw this picture.

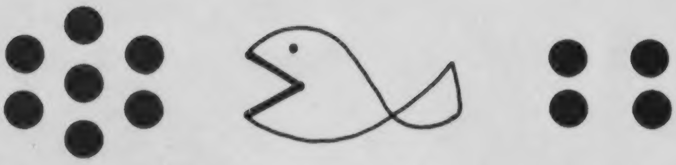


T: How many fish are in this school (point to the dots on the left)? (Seven)

How many are in this school (point to the dots on the right)? (Four)

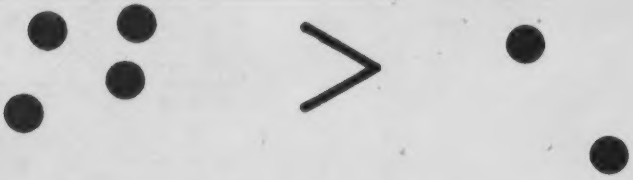
Who would like to come up and show me which school of fish Goldy will eat?

Draw Goldy, making sure the open mouth suggests that Goldy is ready to eat the larger school.

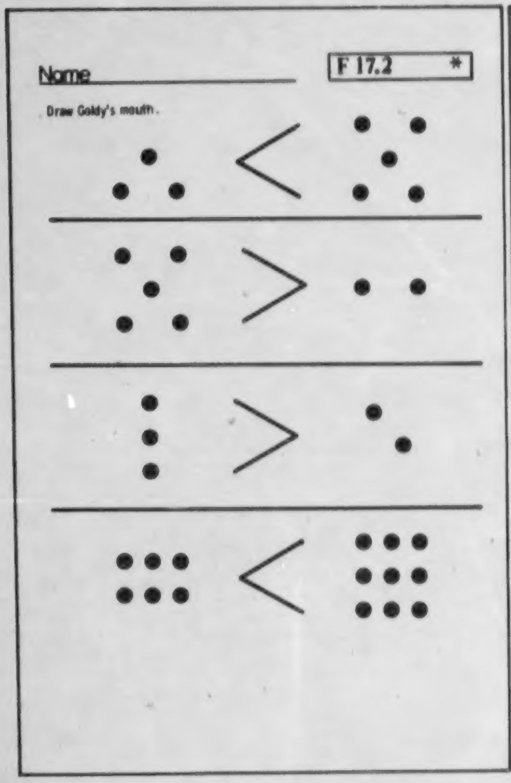


After having gone through several examples, tell the students that from now on you are just going to draw Goldy's mouth.

Do several examples like the following, each time having a student come up to the board to draw in Goldy's mouth.



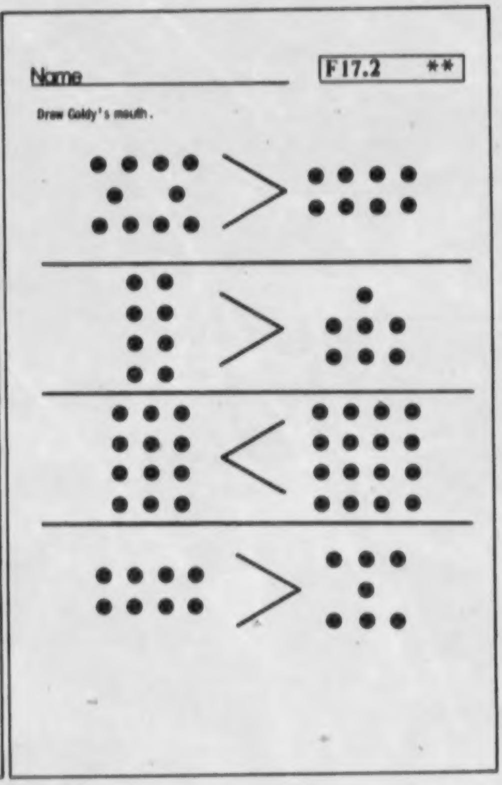
Distribute Worksheets F17.2* and **, instructing the students to draw Goldy's mouth.



Name

F 17.2 *

Draw Goldy's mouth.



Name

F 17.2 **

Draw Goldy's mouth.

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F18.1 Hidden Dots #1

CAPSULE LESSON SUMMARY

Cover some dots in a pattern of dots and associate a numeral with the number of visible dots. Use various patterns and coverings to explore different representations of a number. Write number stories for these different representations.

MATERIALS

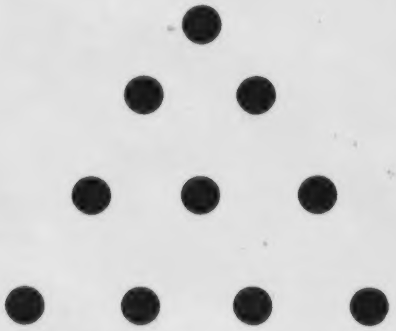
Teacher: Chalk; large sheet of paper

Student: None

DESCRIPTION OF LESSON

Exercise 1: Hidden Dots

Draw ten dots on the board. The dots should be clearly visible yet you must be able to cover several dots with a sheet of paper.

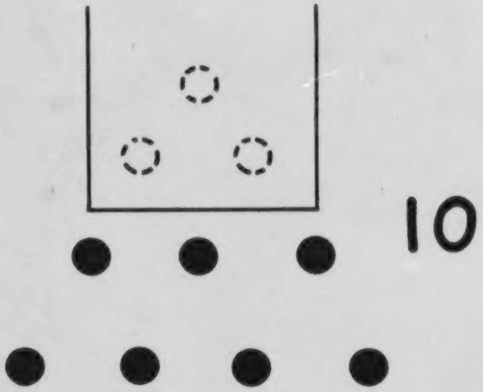


T: How many dots? (Ten)

Ask someone to write "10" on the board, then ask the students to close their eyes.

F 18

Hide some dots with a piece of paper and ask your students to open their eyes again.

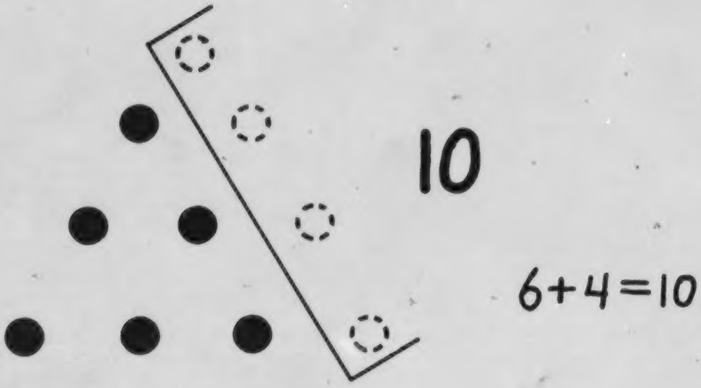


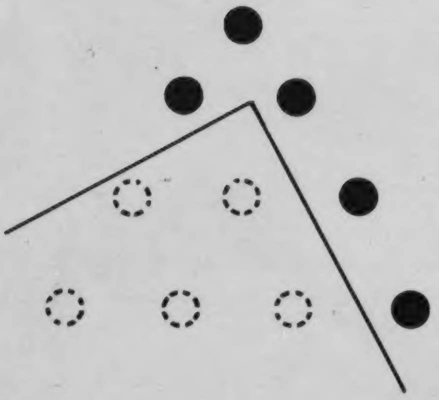
T: How many dots can you see? (Seven)

How many dots are hidden? (Three)

Write "7 + 3 = 10" on the board.

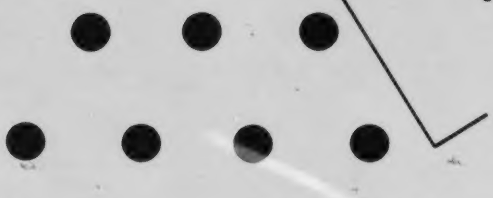
Repeat this activity several times at a brisk pace. Use the following examples or any similar examples.





10

5+5=10



10

10+0=10

F 18

F18.2 Addition Story #2

CAPSULE LESSON SUMMARY

Draw a number of dots for apples and use strings to show apples given to a particular horse. Explore different ways to distribute the apples and write corresponding number stories.

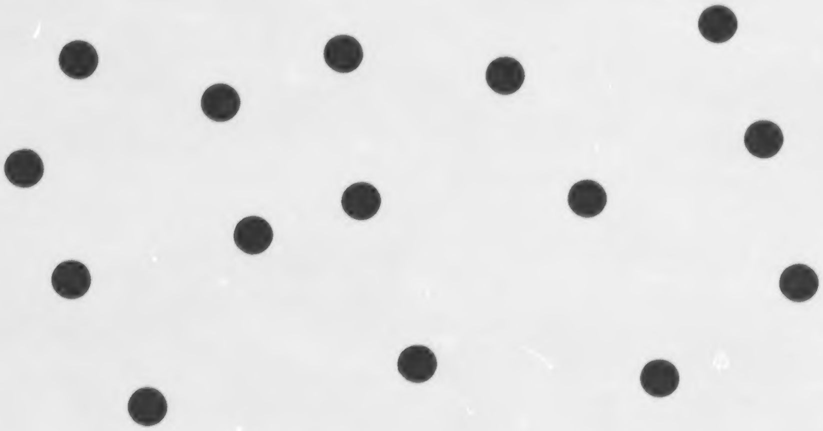
MATERIALS

Teacher: Colored chalk

Student: Paper; colored pencils, pens or crayons

DESCRIPTION OF LESSON

Draw 15 dots on the board. Let the students count as you draw.



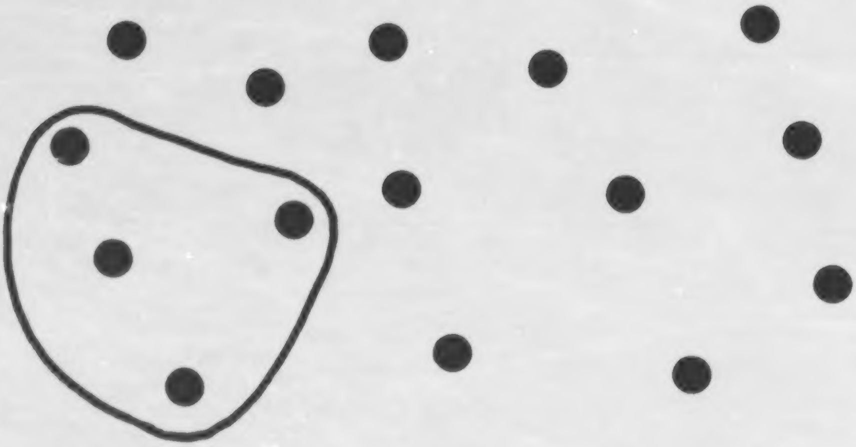
T: These are apples. How many apples? (15)

We are going to give these apples to some horses. You will decide which apples each horse gets. Sally, which apples would you like to give to the first horse?

S: These four.

Draw a colored string around the four dots this student has selected.

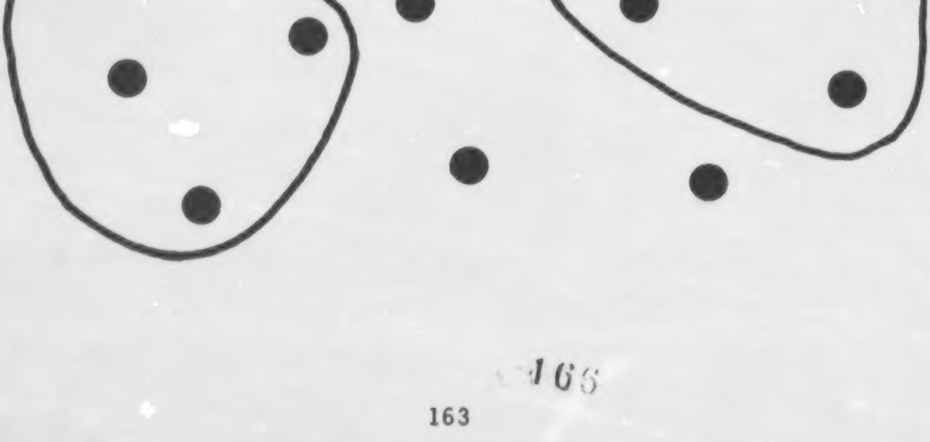
F 18



T: Paul, how many apples would you like to give to the second horse?

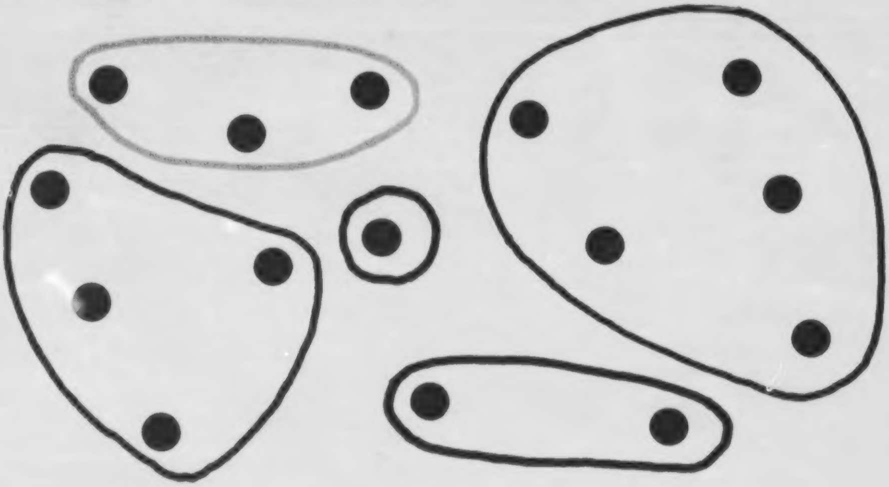
S: Five.

Have the student trace a string around the five apples he gave to the second horse, and then you draw it.



F 18

Continue in this manner until all the apples have been distributed. Your completed drawing might look like this one.



T: Who would like to explain this story again?

S: One horse got five apples, one horse got two apples, one horse got three apples, one horse got four apples and one horse got one apple.

At the top of the board or beside the drawing, write this part of the number story.

$$5+2+3+4+1$$

T: How many apples all together? (15)

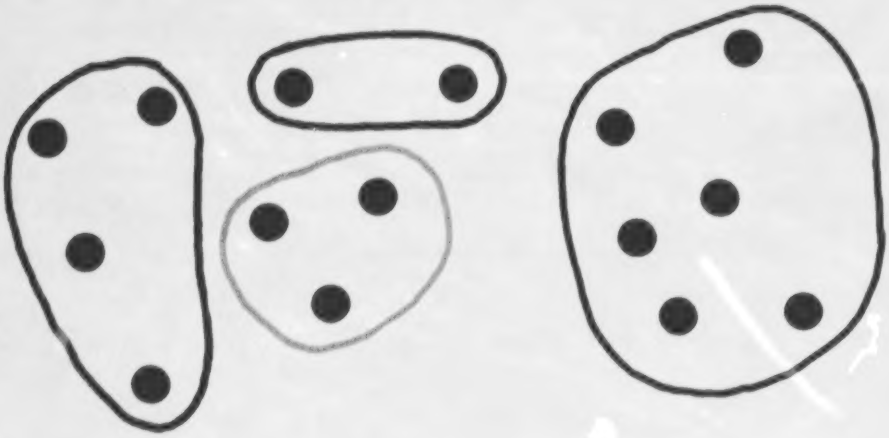
Complete your number story.

$$5+2+3+4+1=15$$

Erase the board and distribute unlined paper. Have each student draw 15 dots and distribute the apples any way they wish.

Students who finish quickly should be asked to find another way to distribute the apples on the back of their drawing.

After a while, ask the students to stop drawing. Have one student show his or her drawing to the class and explain the distribution. For example,



S: In my drawing one horse got six apples, one horse got two apples, one horse got three apples, and another horse got four apples.

Ask for a volunteer to write the number story for this drawing. If the students are unsuccessful, write it on the board yourself.

$$6+2+3+4=15$$

Do this for several pictures. Your board should be full of number stories for 15. If no one could write the number story the first time, try again after writing some yourself.

F 19

F19 Introduction to A-Blocks #2

CAPSULE LESSON SUMMARY

Locate an A-block from a complete description of the block. Discover a hidden block by asking questions which may be answered "yes" or "no". Examine the similarities and differences between two A-blocks.

MATERIALS

Teacher:	One set of A-Blocks; colored chalk
Student:	One set of A-Blocks for each student; a container (to store the A-Blocks)

DESCRIPTION OF LESSON

Start the lesson with five or ten minutes of free play. Then, ask the students to put all the pieces in the middle of their desks.

Exercise 1

T: Without making any noise, hold up the piece I call for. Listen carefully and wait for my signal to pick up the piece.

T: A big, red square . . . Go!
A small, yellow triangle . . . Go!

Be sure to ask for some attributes by using negations.

T: A red triangle . . . not big. Go!
A small square . . . not blue and not red. Go!

Also try using "or".

T: A small circle . . . red or blue. Go!
A big, red piece . . . triangle or square. Go!

Continue as long as interest remains high.

Exercise 2

Hide one piece behind your back.

T: I have hidden a piece and you have to guess which piece it is. You may ask questions which I can answer "yes" or "no".

S: Is it red?

T: No, but that is a good question.

S: Is it green?

T: Yes; good question.

S: Is it big?

T: Yes; good question.

S: Is it blue?

T: No.

After a sufficient number of questions have been asked, ask

T: Now, can anyone guess my piece?

Repeat the game using a different piece. If the students understand the game well enough, you may want to let a student hide the piece and answer the questions.

F 19

Exercise 3

Select any two pieces. The students should explain in which ways the two are alike and in which ways they are different from each other.

For instance, if you choose a large, red triangle and a small, red circle, the students should say:

S: They are both red.

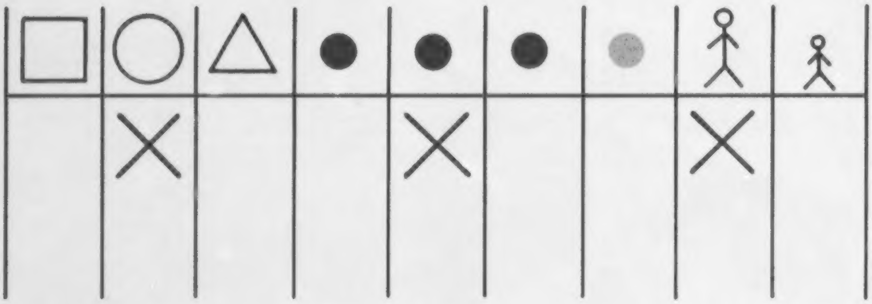
S: One is large and one is small.

S: One is a triangle and one is a circle.

Repeat several times.

Exercise 4

T: This game is a lot like the first one, when you were to pick up the piece I asked for. This time, I won't call out which piece I want; instead, I will give you directions using this secret code.



T: Which piece do I want?

S: A circle, green and large.

Repeat this game several times, having the students hold up the piece which was requested.

F20 Adjustment Day #2

NOTE: See the General Introduction, p. 16 for a full explanation of the purpose of scheduled adjustment days.

Today you may wish to repeat a previous lesson either for a group of students, or for the entire class. Many of the lessons can be made to appear completely different by changing the story, or numbers in the story. Lessons which you may wish to repeat include the following.

F6.1	Walks on One-Way Roads #1
F6.2	Numeral Writing Worksheets
F11.1	Numerical Activity #4
F16.1	Rhythms and Patterns
F17.1	Fingers

This is also a good time for allowing the students to look at the storybook "81 Roses", if you have not already done so.

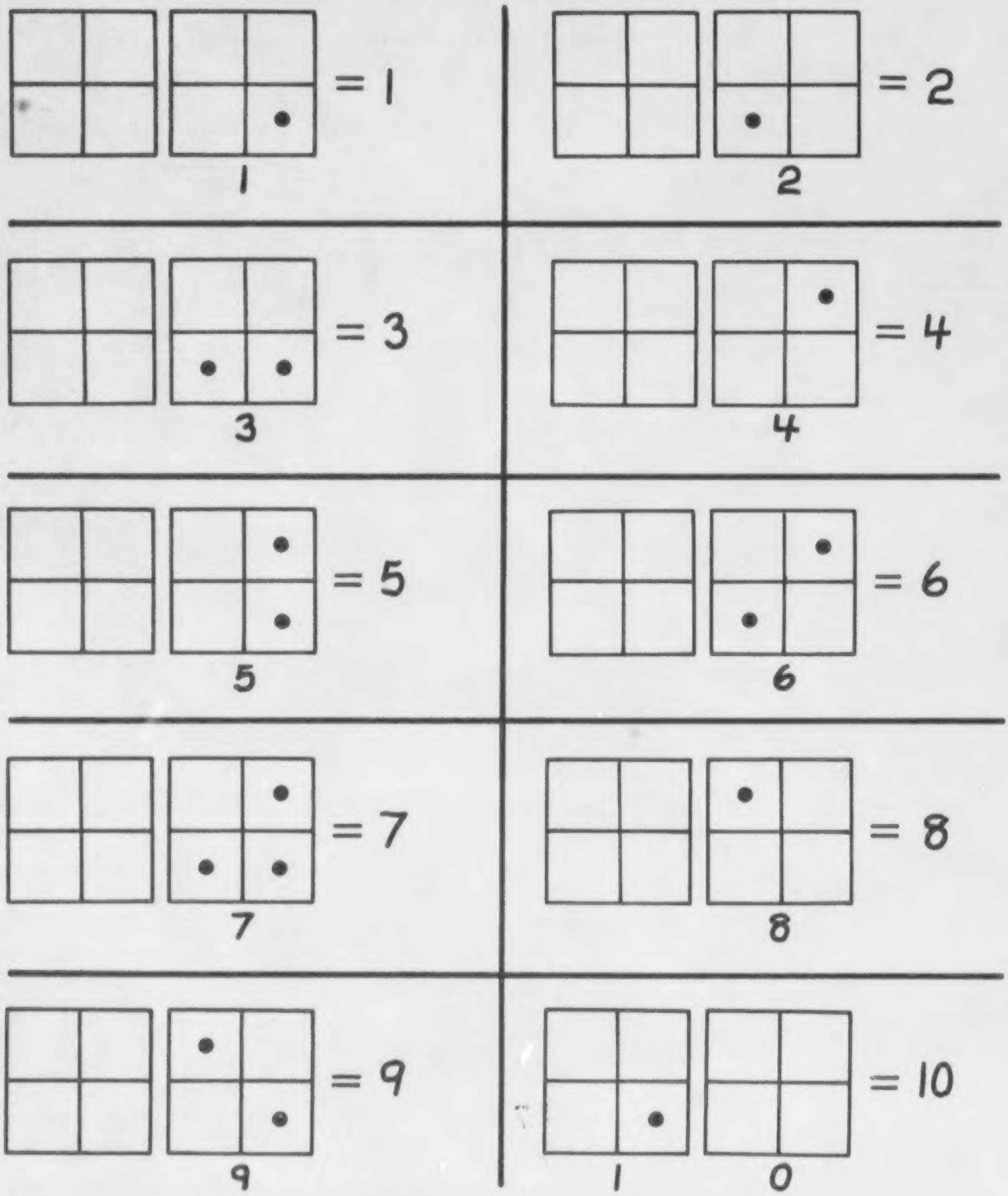
Additional activities for improving the students' numerical readiness would include those listed at F10 Adjustment Day #1 (p.107).

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with F21 Minicomputer Introduction #1.

MINICOMPUTER GLOSSARY (For Teacher's Information Only)

STANDARD MINICOMPUTER CONFIGURATIONS OF THE NUMBERS 1-10

(Each board is oriented so that the white square is in the lower right hand corner.)


= 1
1
= 2
2
= 3
3
= 4
4
= 5
5
= 6
6
= 7
7
= 8
8
= 9
9
= 10
1
0

F 20

EARLY WARNING !

Among the next nine classroom lessons are some which require extra preparation time, or which involve materials not included with the CSMP classroom set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (These special materials have been listed here only once, even if they are needed more than once during the nine-day period.)

F21	Minicomputer Introduction #1: (If you choose to suspend the Minicomputer boards from the top of your chalkboard, you will need either the special hooks available from CSMP, or some other suitable hooks you may have.)
F22.1	Guess My Rule with A-Blocks #1: masking tape
F23.1	Brother-Sister Graph #2: pointer, large sheet of paper
F24	A Game With Strings: two pieces of string (or yarn), each a different color, for each student
F28.2	Hidden Dots #2: large sheet of paper (to hide dots)

F21 Minicomputer Introduction #1

CAPSULE LESSON SUMMARY

Use the Minicomputer to represent the numbers 1 through 10 and to explore the representation of numbers larger than 10.

MATERIALS

Teacher: Minicomputer set*
Student: None

The demonstration Minicomputer boards may be suspended from the top of your chalkboard using the special hooks (available from CSMP), or they may be propped on the chalk tray. However they are displayed, it is important that the students can see and reach them easily. If the Minicomputer boards are suspended, numerals can be written on the chalkboard below the Minicomputer. When the Minicomputer boards are propped on the chalk tray, numerals can be written on the chalkboard above the Minicomputer.

It would be nice if the Minicomputer could remain prominently displayed in the classroom throughout the school day.

DESCRIPTION OF LESSON

This first introduction to the Minicomputer should be an informal but challenging one. There will be several other lessons introducing the Minicomputer, and each of them will include a review of the configurations first presented in this lesson. Do not be worried or surprised if your students fail to "master" the Minicomputer after only one lesson.

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*A teacher's Minicomputer set consists of four demonstration Minicomputer boards and a sufficient number of magnetic Minicomputer checkers.

F 21

NOTE: This lesson calls for the use of three Minicomputer boards rather than one or two. This encourages the students to develop an appreciation of positional representation more quickly than they might if fewer boards were used.

Exercise 1

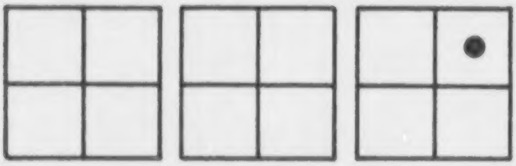
Display three Minicomputer boards.

T: Show me four fingers. Trace a "4" on your desk. That's one way to write "4". Here's another way.

Point to the Minicomputer.

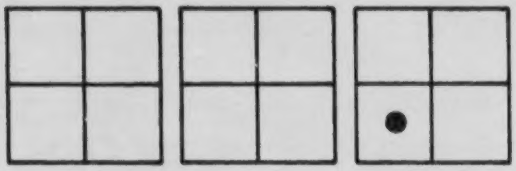
T: This is called the "Minicomputer". I am going to put 4 on the Minicomputer.

Put one checker on the purple square of the ones' board.



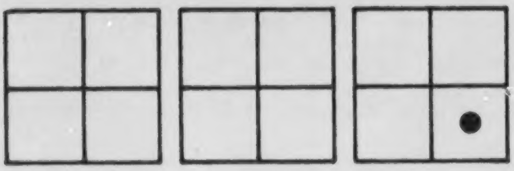
T: This is the number 4 on the Minicomputer.

Move the checker to the red square of the ones' board.



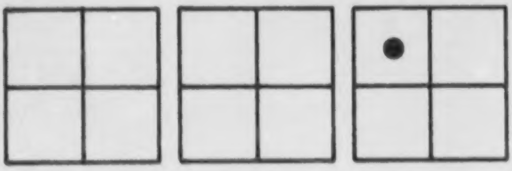
T: This is the number 2 on the Minicomputer.

Move the checker to the white square of the ones' board.



T: This is the number 1 on the Minicomputer.

Move the checker to the brown square of the ones' board.



T: What number do you think this is?

Some students will probably guess 3 or 5.

T: No, it's not 3 (or 5).

F 21

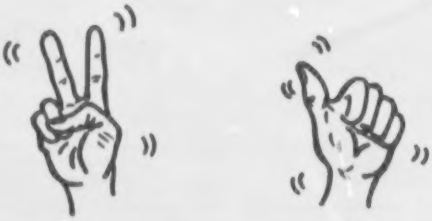
Pause. After a moment some student will probably suggest 8. If not, simply say:

T: This is 8.

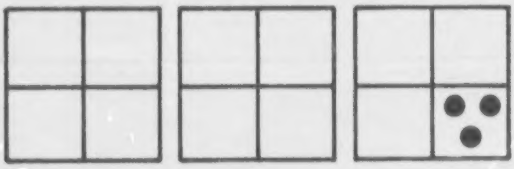
Move the checker quickly from one square to another on the ones' board and ask the class to call out each number. In doing this, follow the doubling pattern: 1, 2, 4, 8.

T: Who can put 3 on the Minicomputer?

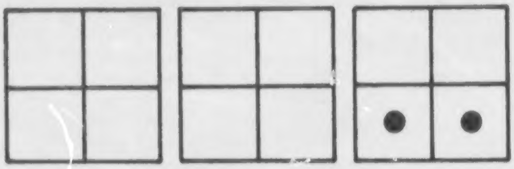
If you have volunteers, ask them to tell you first how many checkers they will need. (Two and three are both correct answers.) If no one knows how to put 3 on the Minicomputer, say: "To show 3, you'll need at least two checkers." If this hint doesn't help, hold up your thumb and two other fingers. Alternately wave the two fingers and the thumb saying, "Three is two plus one."



With this hint, someone should be able to put 3 on the Minicomputer. Ask a volunteer to put the checkers on the Minicomputer. If the student is not correct, remove the checkers and ask for another volunteer. There are two correct ways to put 3 on the Minicomputer.



If a student places three checkers on the white square, lift the checkers one-by-one and say "one plus one plus one is three." Ask if someone can show 3 another way, and remove the checkers from the board.



If a student places one checker on the red square and one checker on the white square, lift each checker as you mention it and then replace it quickly on the board.

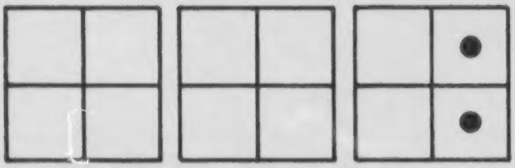
T: What number is on the red square? (2) What number is on the white square? (1) Two plus one is three. One plus two is three.

Remove the checkers from the Minicomputer.

T: Who can put 5 on the Minicomputer?

As you ask this question, hold up your hand and show five fingers. Ask volunteers to tell you first how many checkers are needed. (Two, three, four, and five are all correct answers.) Ask a volunteer to place the checkers on the Minicomputer. For each correct solution, orally sum the numbers represented by the individual checkers as you did for 3. Whenever more than two checkers are used, ask for another way with one less checker until you get the standard configuration shown on the next page.

F 21



When the checkers are in this position, lift each checker as you mention it and replace it on the board quickly.

T: What number is on the purple square? (4) On the white square? (1) Four plus one is five. One plus four is five.

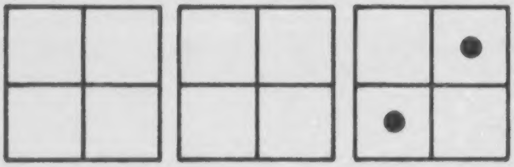
Remove the checkers from the Minicomputer.

If the students are interested and are enjoying the lesson, continue with Exercise 2.

Exercise 2

T: Can anyone put 6 on the Minicomputer?

Accept all correct answers. If more than two checkers are used, ask for another way using one less checker until you get the standard configuration.



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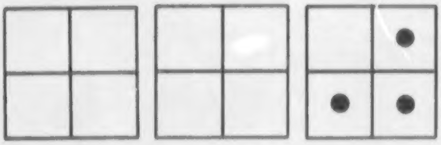
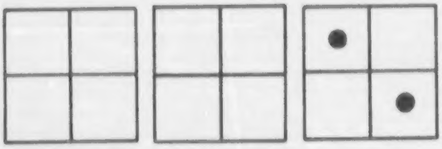
T: Can anyone show 7?

Accept all correct answers. If more than three checkers are used, ask for another way using one less checker until you have the standard configuration.



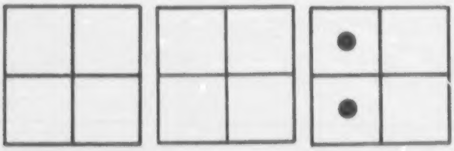
T: Can anyone show 9?

Accept all correct answers. If more than two checkers are used, ask for another way using one less checker until you get the standard configuration.



T: Can anyone show 10?

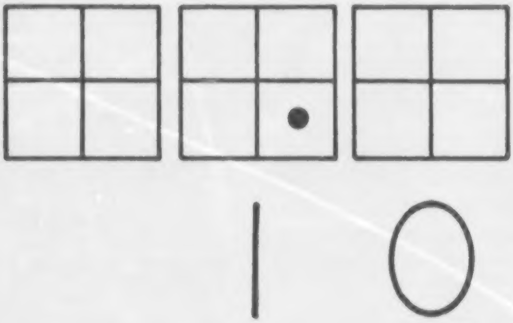
Someone will probably suggest this configuration.



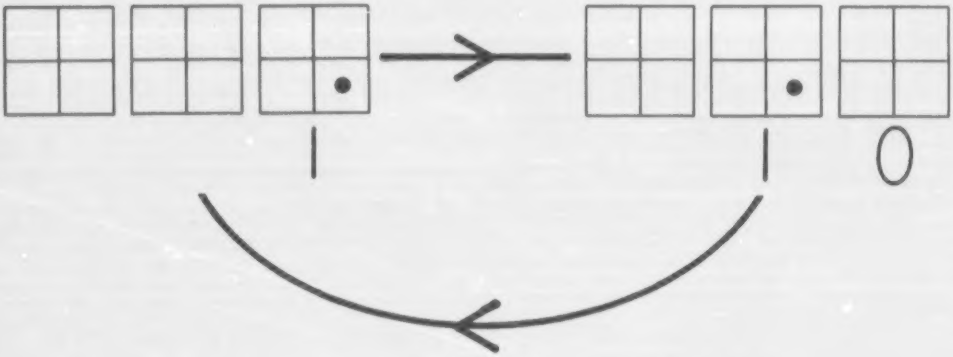
F 21

T: There is a way to show 10 with only one checker.

Place one checker on the white square of the tens' board. Write "1" below (or above) the tens' board and "0" below (or above) the ones' board.



Move a checker back and forth from the white square on the ones' board to the white square on the tens' board. As you do this, have the class say, "One - ten - one - ten - one - ten."



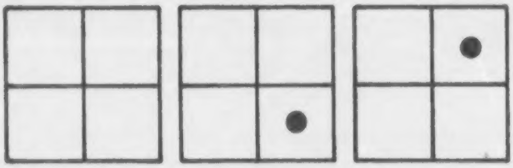
If the class is interested and is enjoying the lesson, continue with Exercise 3.

Exercise 3

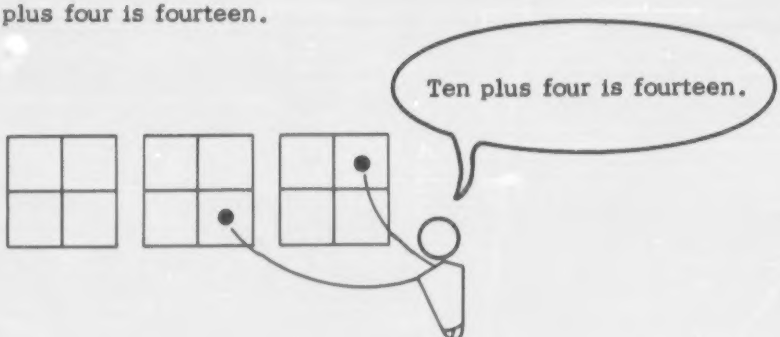
The purpose of this activity is to provide the students the freedom to explore this new tool with enthusiasm and creativity. There will be more review activities in later lessons.

Ask the class if someone would like to put a number on the Minicomputer which is more than 10. If some students volunteer to put numbers on the Minicomputer, let them do so.

If no one volunteers, put 14 on the Minicomputer yourself.



T: What number is this? (14)
Ten plus four is fourteen.


Ten plus four is fourteen.

F 21

T: Who would like to write "14" on the chalkboard?

Have the student write "14" to one side of the Minicomputer. You yourself should write "1" below (or above) the tens' board and "4" below (or above) the ones' board.

Repeat this activity with several other numbers, again asking first for volunteers.

NOTE: Some teachers have asked us why we do not write the values of the various squares on the Minicomputer. The ease with which even pre-school children learn to represent numbers on the Minicomputer is facilitated by the use of color and positional representation. Children who are often frustrated by a curriculum with a preponderance of numeral writing are able to employ the Minicomputer in their investigations of the world of numbers.

Writing the values on the various squares of the Minicomputer adds an unnecessary, complicating factor which detracts from the positional representation. We believe that these labels will hinder the awareness of this positional representation and retard the slower students in their ability to perform calculations on the Minicomputer.

F22.1 Guess My Rule with A-Blocks #1

CAPSULE LESSON SUMMARY

According to a secret rule, place a sequence of A-blocks on the board. Let the students guess what the rule might be.

MATERIALS

Teacher: One set of A-Blocks; masking tape

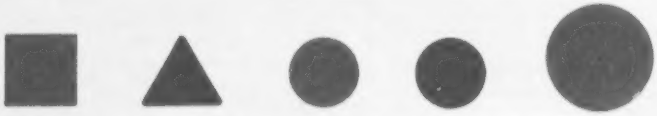
Student: None

DESCRIPTION OF LESSON

NOTE: If you have a magnetic board, you may wish to use a set of A-blocks which you have "magnetized" with the adhesive magnetic material provided with the A-Block String Game kit. If you use masking tape instead, make sure the board is as clean as possible (for good adhesion).

T: I'm going to put some A-blocks on the board. But each time I put one up I must follow a rule. See if you can guess what my rule is.

Display the following A-block pieces, one at a time, from left to right. Attach them to the chalkboard with a loop of masking tape. These pieces may be any size or shape, as long as they alternate in color; blue-red-blue-red-... .



T: Which piece do you think I could put up next?

Let a student come up and select an A-block piece from those in your set. If the student selects, for example, a small, red triangle (or any red piece), say:

T: That piece does follow the rule I am thinking of.

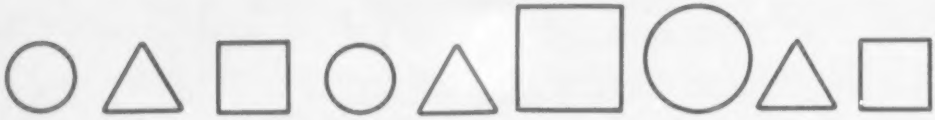
Place the suggested block on the board. If a student selects a piece of a color other than red, say:

T: That block does not follow my rule.

Every sequence of blocks follows some rule, although the rule may be an arbitrary one (such as blue-red-blue-red-blue-green/blue-red-blue-red-blue-green; and so on). There are really no wrong answers in this lesson; so do not tell students they are wrong, only that the block does not follow your rule.

Continue asking students to select blocks following the alternating color pattern. When you feel most or all of the pupils know your rule (i.e., recognize the pattern), have someone verbalize the rule.

Remove all the blocks and repeat the lesson with a different rule. Be sure to tell the class that you are using a different rule. One sequence whose rule is not too much more difficult than the first rule is the following:



Color and size are irrelevant here. You will probably have to continue the sequence even further before the circle-triangle-square pattern becomes evident.

This time you may want to let students who think they know the rule whisper it to you.

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F 22

F22.2 The Mailman #2

CAPSULE LESSON SUMMARY

Draw two strings (one for birthday cards and the other for children) and a specified number of dots in each string. Have the students copy this drawing. Give orally rules for them to draw arrows showing cards delivered to children.

MATERIALS

Teacher: Colored chalk
Student: Paper; colored pencils, pens or crayons

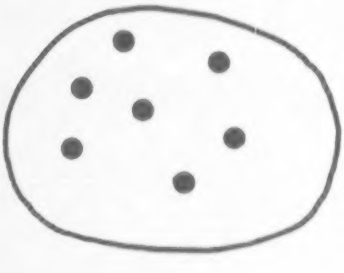
DESCRIPTION OF LESSON

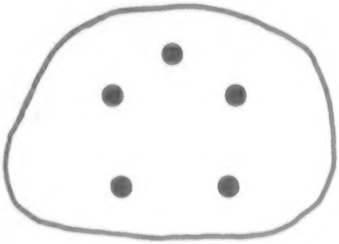
NOTE: It is important that your students learn to follow directions and to solve problems individually. Begin the lesson by explaining to the students that they should listen carefully because you will only give the instructions once. Let a student repeat your instructions, but then the students should work individually.

Remind the students of the mailman who delivered birthday cards (Lesson F11.2).

T: Today, you will each be the mailman who delivers birthday cards to the children; but you must follow certain rules.
First, there are exactly seven cards and only five children.

Draw these dots and strings on the board.

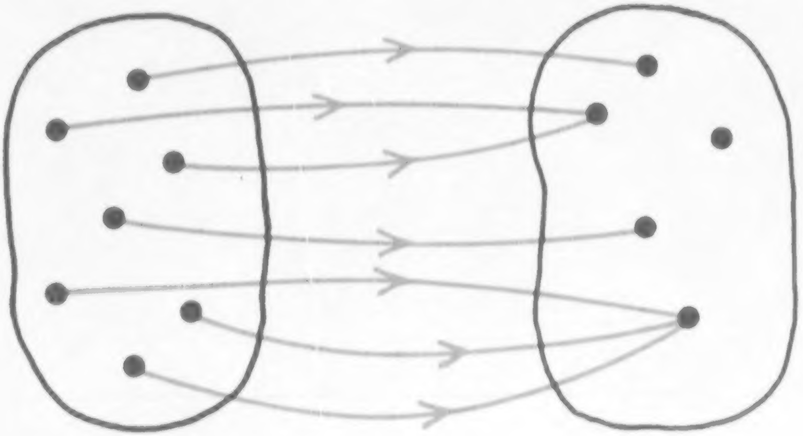


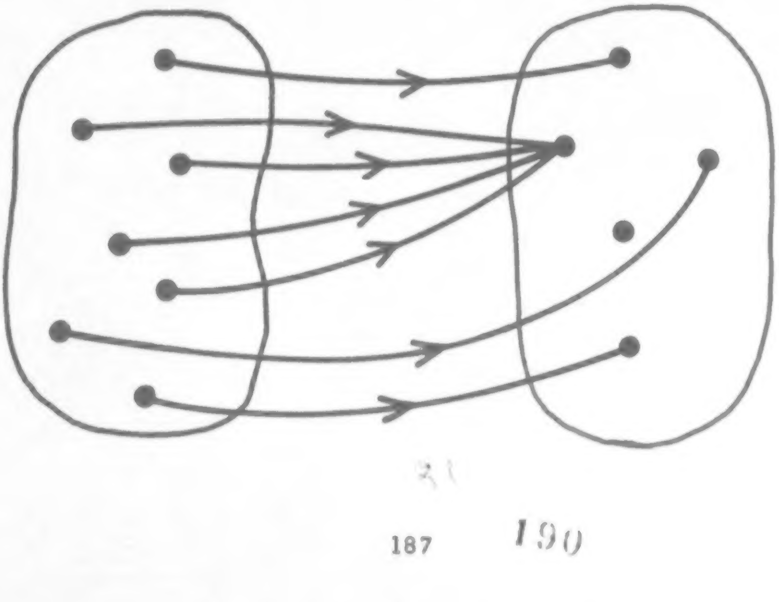


T: Next, all the cards must be delivered, but each card may be delivered only once (i.e., no two children may receive the same card). One last rule: exactly one child does not receive any cards.

Have one student repeat the rules. Remind the students to make big, beautiful dots with their regular pencils and to use one color for the arrows.

When most of the students have solved the problem, you may wish to let some students show their drawings to the class and explain them. Many correct drawings are possible. Any picture is correct if exactly one child receives no cards; all the cards are delivered; and seven cards and five children are shown. Some of the students' drawings might look like these.





F 23

F23.1 Brother-Sister Graph #2

CAPSULE LESSON SUMMARY

Draw dots for children and do some counting exercises with these dots. Review the game in Lesson F15.1 and draw arrows for "you are my sister". Introduce arrows for "you are my brother" and investigate where such arrows can be drawn.

MATERIALS

Teacher: Colored chalk; pointer; sheet of paper

Student: None

DESCRIPTION OF LESSON

Draw 15 dots spread out across the board.

T: Here are some children who are on the playground.

Ask various students to come forward and count the children. This will not be easy for every student. It is difficult to remember which dots have been counted. Call on students who sometimes have difficulty counting beyond ten.

Have the students close their eyes while you cover three dots with a sheet of paper. When the students open their eyes, let several volunteers come and count the children who are not hiding. Call on several students, even if the first student counts correctly.

T: How many children are not hiding? (Twelve)
How many children are hiding? (Three)

Someone in the class should be able to calculate the difference between 15 and 12.

Repeat this activity, covering five dots this time. Then, continue.

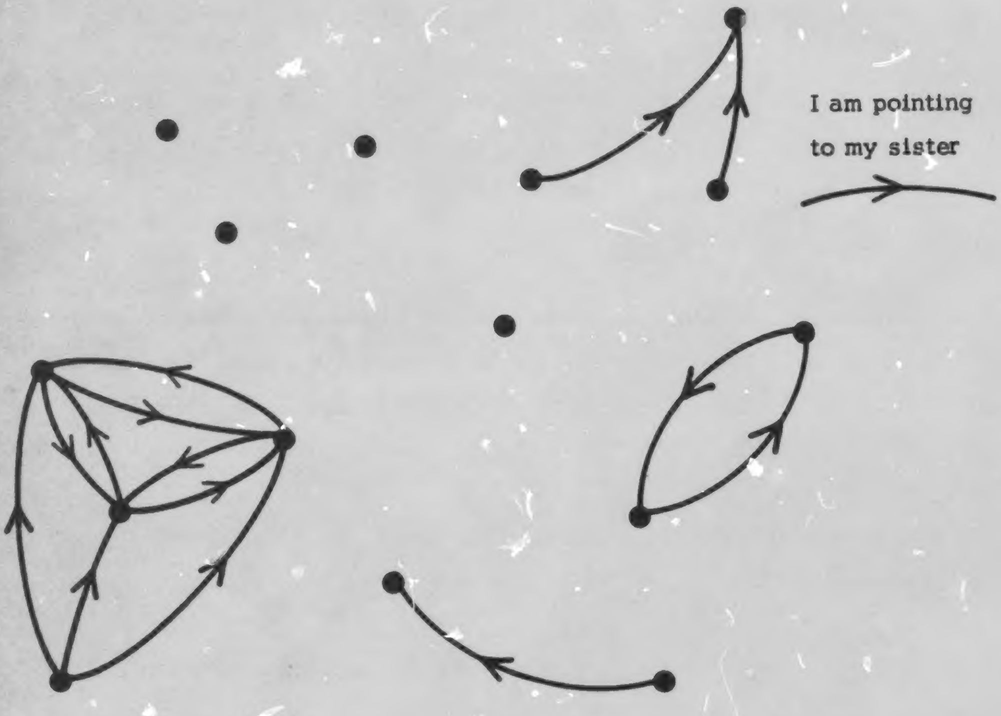
T: These are the same children who were on the playground the other day. Who remembers the game they played?

S: I am pointing to my sister.

T: Right. Let's show them playing this game.

Add these arrows to the picture on the board. Be sure to put a "key" arrow in an upper corner of the picture (i.e., a "key" to the meaning of the arrows).

F 23



T: These are all the blue arrows that can be drawn.

Let students point out the boys and girls that this arrow picture allows us to determine. (See the answer key in Lesson F15.1, p. 139.)

T: Today the children on the playground have played another game. Can you think what it might be?

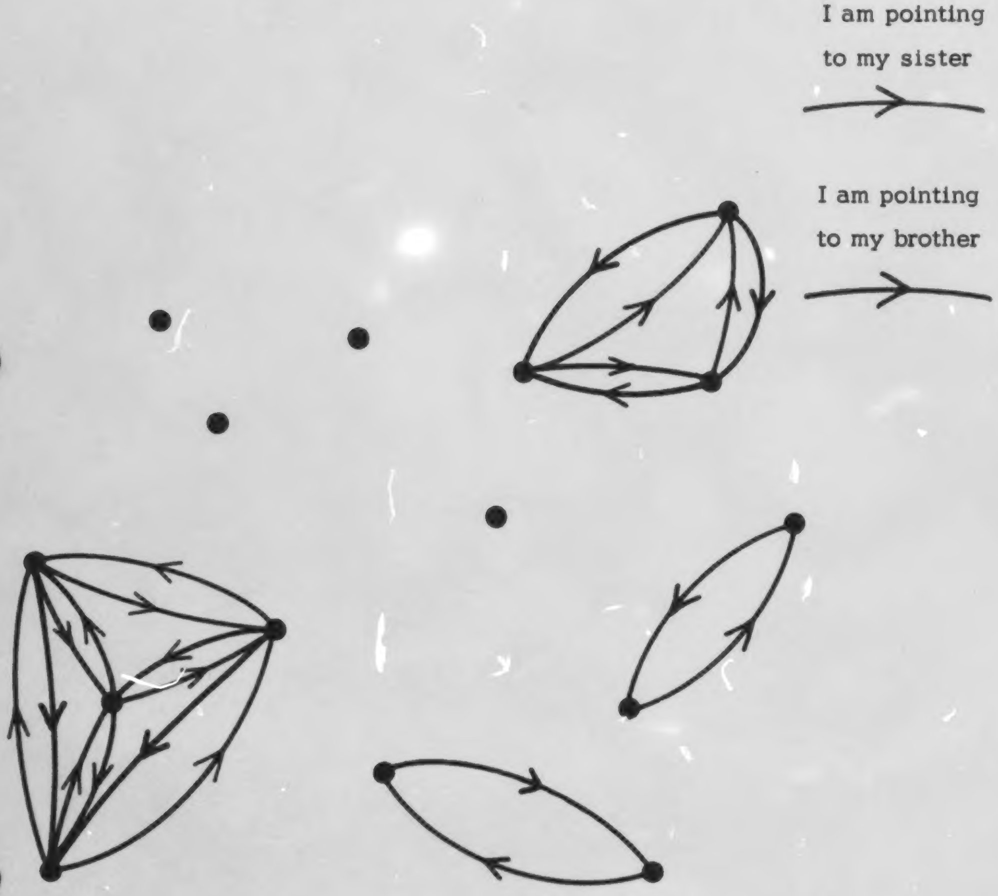
If no one suggests "I am pointing to my brother", suggest it yourself.

T: We can show them playing this game with red arrows. Can anyone show me, with the pointer, where we may surely draw a red arrow?

When a correct red arrow is traced, draw it yourself. Ask how we can be certain that this red arrow should be drawn, but do not expect a well-phrased answer.

There are two types of situation for which red arrows may be drawn. In one, a boy has pointed to his sister (in blue); the sister then points back (in red). In the other, two boys point to the same girl (in blue); since they both have the same sister, they are brothers--and point to each other (in red).

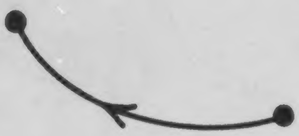
In this picture, you will find all the red arrows that can be added to the previous arrow picture.



If your students experience difficulty in finding all the red arrows, focus their attention on specific parts of the drawing and ask how the children are related.

F 23

For example, point to this part of the picture (as shown on p. 190).



T: Which of these children is a girl? (The left one)
How is she related to this child (point to the dot on the right)?

S: She is that child's sister.

T: Could this child be a girl (point to the dot on the right)?

S: No; then they would both be sisters and there is no blue arrow ending at that dot.

S: It must be a boy.

S: It's the first child's brother.

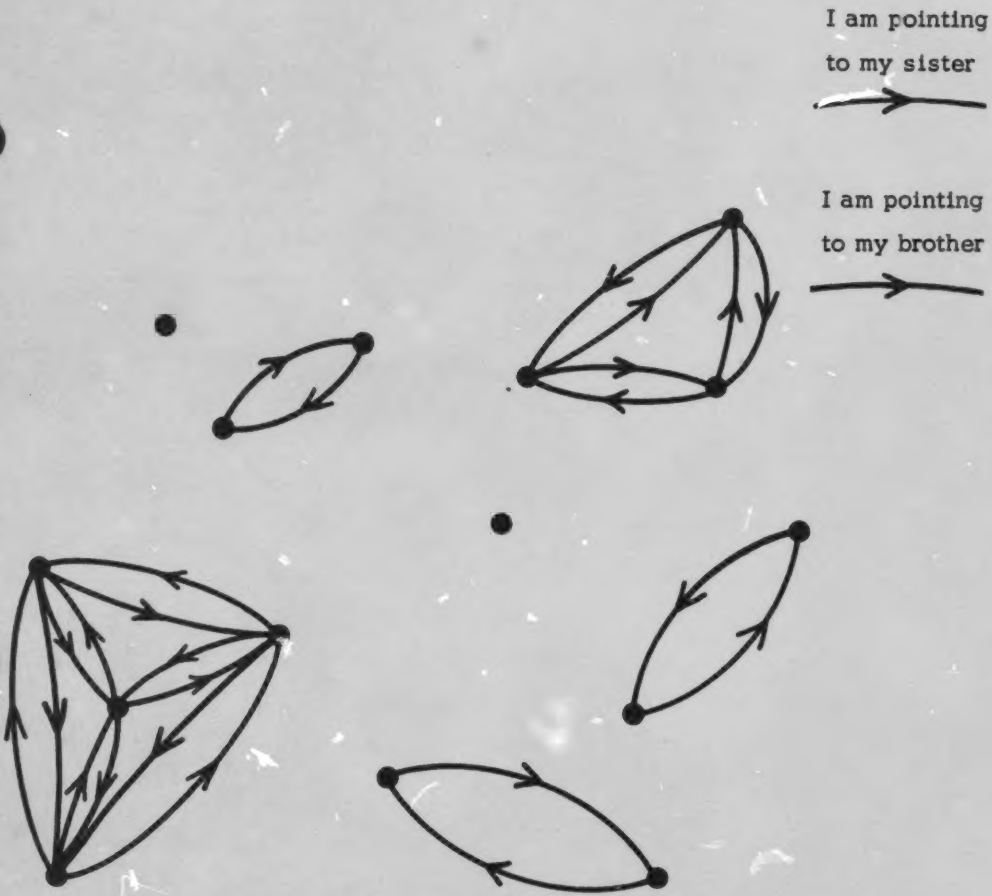
T: Who can trace an arrow to show that he is her brother?

Continue in this way until all the red arrows in the picture on the following page have been drawn.

T: When the children played this new game, they discovered two more red arrows that could be drawn.

F 23

Complete the drawing by adding two more red arrows.


I am pointing to my sister
I am pointing to my brother

T: Was it possible for us to have known about these two arrows?

S: No; we couldn't tell whether those children were girls or boys.

T: What do these red arrows (point to the "new" red arrows) tell us?

S: The two children are boys.

S: They are brothers.

F 23

T: Now the picture is finished. All the red arrows are drawn. All the blue arrows are drawn. What do we know about this child (point to one of the isolated dots)?

S: That child has no sister and no brother.

T: That could be so, but can you be sure this child has no brother or sister?

S: That child has no sister or brother on the playground .

F23.2 Counting Activity #1

CAPSULE LESSON SUMMARY

As a class do some counting exercises; count forward, backward, and by twos. Vary the activity by challenging separate rows or tables to do the counting.

MATERIALS

Teacher: None

Student: None

DESCRIPTION OF LESSON

T: Let's see how well the class can count; but we won't all count together. The first person I point to will say "one", the second will say "two", then each person I point to will say the next number. Let's see if we can do it without making any mistakes.

Walk up and down each row or around each table pointing to the students in order until each has participated. Make corrections if necessary.

If there is much hesitation or many mistakes during this activity, tell the students you believe they can do better, and begin again. If the activity is successful, try a similar exercise in which you point to the students at random.

T: Now let's see how well each row (or table) can count.

Call on students, from the front to the back of each row (or around each table) using one or two of the following variations:

- Count by twos.
- Count backward from some number.

Make corrections where necessary.

F24 A Game With Strings

CAPSULE LESSON SUMMARY

Have the students place A-blocks in a string, according to the attributes of each A-block. Using two strings, have the students place each A-block according to its attributes.

MATERIALS

Teacher: Colored chalk

Student: One set of A-Blocks for each group of four students; two pieces of string (or yarn) of different colors for each group (the ends of each piece of string should be tied together to form a loop).

DESCRIPTION OF LESSON

NOTE: Do not give away the "secret" of overlapping the strings! If no one finds it, stop the lesson as indicated and play the game again on the next free day.

Divide the class into groups of four and give each group a set of A-blocks. Allow several minutes of free play while you distribute one loop of string to each group.

T: Make a big loop with the string on your desk. Put all the green pieces inside the string.

Quickly check that each group has formed a loop with the string and has placed all its green pieces inside.

T: Now, take the green pieces out . . . and put all the circles inside the string.

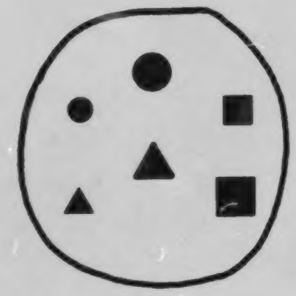
Walk around the room to see how well this is being done. Give each group a second loop of string (a different color).

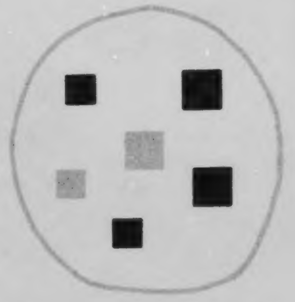
T: Place all the blue pieces inside one string and all the yellow pieces inside the other.

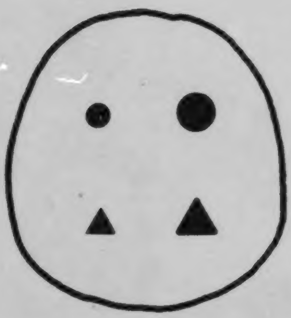
After checking and helping where necessary, continue.

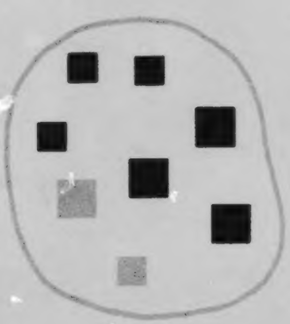
T: Empty the strings . . . and put all the red pieces inside one string and all the square pieces inside the other.

Most likely the strings will not have been overlapped, resulting in one of the following situations (NOTE: Some pieces are not pictured here).









In the first situation, you should pick up a red square and say:

T: Isn't this a square? The other string is for squares.

When the students move the red squares to the other string, ask:

T: But, what is the first string for? (Red pieces)
Are all the red pieces inside the first string? (No)

In the second situation, pick up a red square and say:

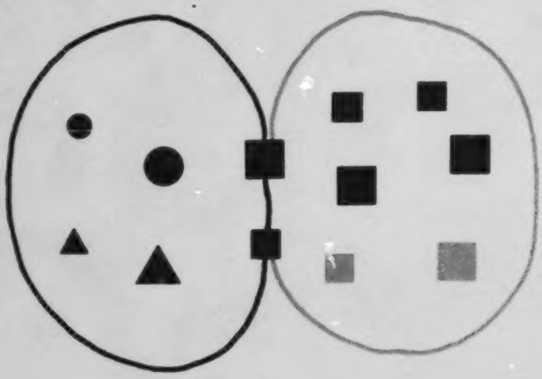
T: Isn't this red? The first string is for red pieces.

When the students move the red squares to the first string, ask:

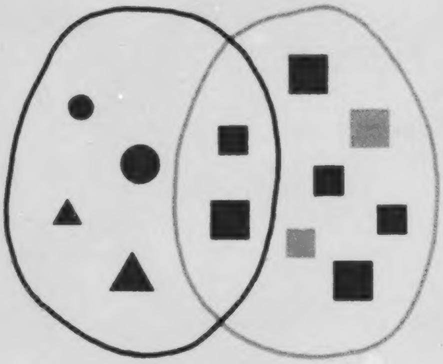
T: But, what is the other string for? (Squares)
Are all the squares inside that string? (No)

Walk around the room making similar comments to each group. Some students may suggest putting half the red squares in one string and half in the other. Point out that all the squares, not just some, must be inside the string for the squares and all the red pieces must be inside the string for the red pieces.

If no group suggests overlapping the strings, push its strings very close together and put the red squares near the edge of one string and close to the other. Students might then suggest the following arrangement.



Remind the students that the red squares must be inside, not on, both the string for the red pieces and the string for the squares. Be patient; do not reveal the secret. Eventually someone will suggest the overlapping of the two strings . . .



. . . which allows us to put the red squares inside both strings.

If it appears that no one will discover the "secret" at this time, stop the lesson here, ask the students to think about the problem, and try this activity again on an adjustment day. A similar problem is considered in Lesson F33.

If the "secret" is discovered, draw two overlapping strings on the board. Label one string as being for red pieces and one for squares. Hold up a piece and let someone come to the board and draw a dot for that piece. In doing this, select at least one piece from each of the four categories:

- Red pieces which are not squares
- Squares which are not red
- Red squares
- Pieces which are not red and not square

2 2

F 25

F25.1 Minicomputer Introduction #2

CAPSULE LESSON SUMMARY

Use the Minicomputer to represent the numbers from 1 through 10. Introduce some Minicomputer plays.

MATERIALS

Teacher: Minicomputer set

Student: None

DESCRIPTION OF LESSON

Exercise 1

Display three Minicomputer boards.

T: Who remembers how to put 2 on the Minicomputer?

Ask a volunteer to put 2 on the Minicomputer. Praise any correct answer given. If the answer is incorrect, tell the class which number has been put on the Minicomputer and ask for another volunteer.

Repeat this question for the numbers 4, 1, and 8. Review these numbers very briefly with the students, and remove all checkers from the Minicomputer.

Hold up three fingers.

T: Who can put 3 on the Minicomputer?

If a student shows 3 by putting three checkers on the white square of the ones' board, lift the checkers one-by-one and say, "One plus one plus one is three." Remove the checkers and ask if someone can put 3 on the Minicomputer in another way.

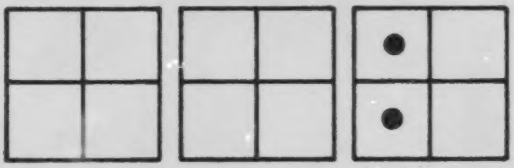
When a student shows the standard configuration for 3, lift each checker as you mention it and then replace it quickly on the Minicomputer.

T: Two plus one is three.
One plus two is three.

Demonstrate this fact with your fingers. Remove the checkers from the board and repeat this activity for 5, 6, 9, 7, and 10. Accept all correct answers but continue to ask for another way using one less checker until a student suggests the standard configuration.

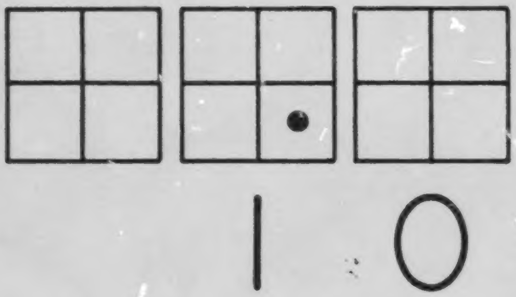
If you have not introduced your students to the standard configuration for 10 in Lesson F21, do so now.

T: Can anyone put 10 on the Minicomputer?



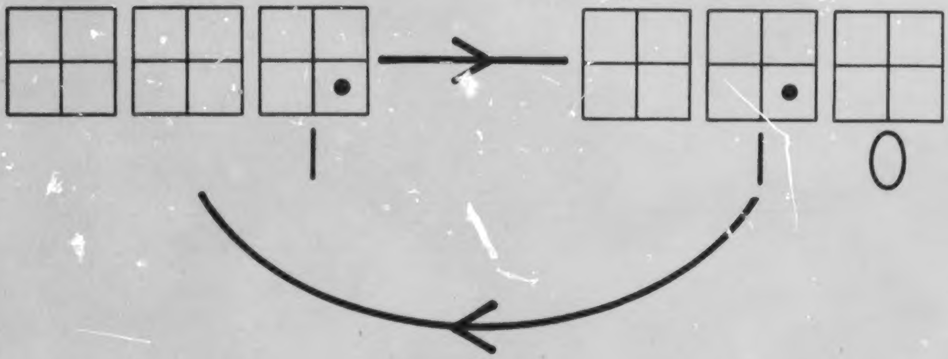
T: Yes; eight plus two is ten.
There is another way to show 10, using only one checker.

Remove the checkers from the board and place one checker on the white square of the tens' board. Write "1" below (or above) the tens' board, and "0" below (or above) the ones' board.



F 25

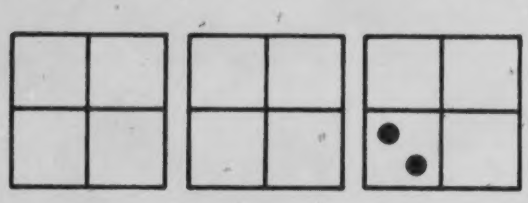
Move the checker quickly back and forth from the white square on the ones' board to the white square on the tens' board. As you do this, have the class say, "One-ten-one-ten."



If your students are interested and are enjoying the lesson, continue with Exercise 2.

Exercise 2

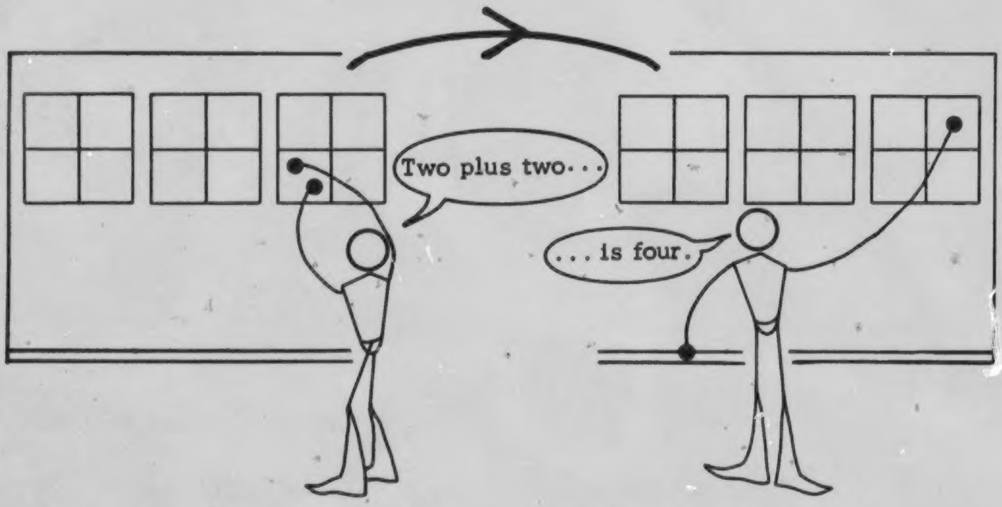
Put two checkers on the Minicomputer as shown.



T: What number is this? (4)
How do you know? (2 + 2 = 4)
This is 4 shown with two checkers. Could someone show us how to put 4 on the Minicomputer with only one checker?

If a student puts a checker on the purple square but fails to remove the two checkers from the red square of the ones' board, ask what should be done with those checkers. Repeat the play yourself in a very dramatic way making what you are doing as obvious to the students as possible.

First, pick up the two checkers on the red square. Be sure to use both hands, with one checker in each hand. As you pick them up say, "Two plus two is four." Then put one of the checkers on the purple square and put the other checker away.



Pause a second and then pick up the checker on the purple square and say, "Four is the same as two plus two." While you are speaking pick up another checker and place both checkers on the red square.

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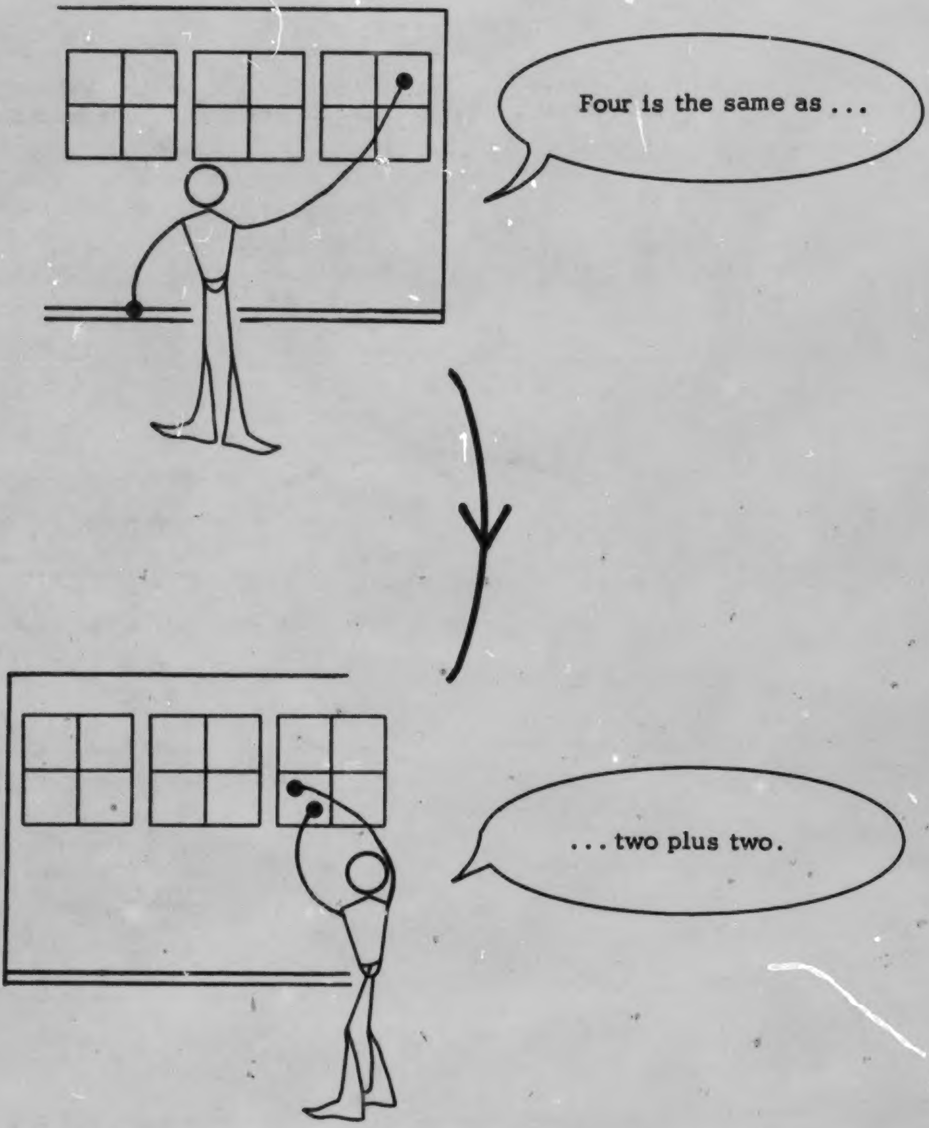
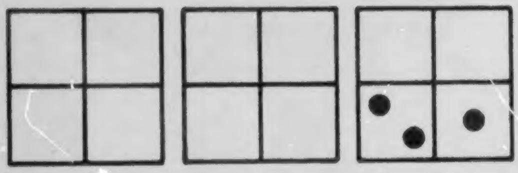

Four is the same as . . .
. . . two plus two.

If the class is interested and is enjoying the lesson, continue with Exercise 3.

Exercise 3

Put three checkers on the Minicomputer as shown.



T: What number is this? (5)

How do you know? (4 + 1 = 5 or 2 + 2 + 1 = 5)

Could someone show us how to put 5 on the Minicomputer with only two checkers?

When someone puts the standard configuration for 5 on the Minicomputer, you should demonstrate the "4 = 2 + 2" and "2 + 2 = 4" plays again.

T: This is another way to show 5 because 4 = 2 + 2 . . .

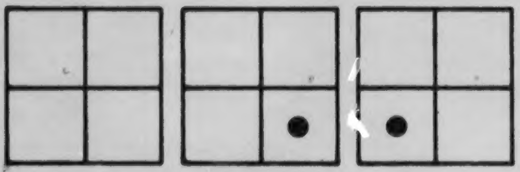
Demonstrate the "4 = 2 + 2" play.

T: . . . and 2 + 2 = 4.

Demonstrate the "2 + 2 = 4" play.

Exercise 4

Put this configuration on the Minicomputer.

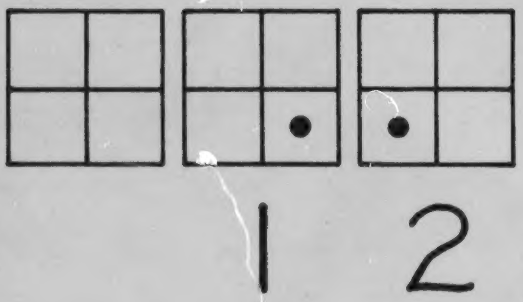


F 25

T: What number is this? (12)

Ten plus two is twelve.

Point to the appropriate checkers as you say this. Write "12" below (or above) the Minicomputer.



F25.2 Goldy #2

CAPSULE LESSON SUMMARY

Use a story situation to determine which of two groups has more objects. Introduce the symbols "<", ">", and "=", and use them to write number stories.

MATERIALS

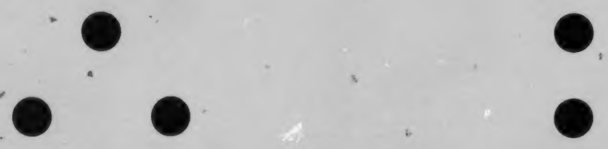
Teacher: None

Student: Worksheets F25.2* and **

DESCRIPTION OF LESSON

Exercise 1

Ask a student to tell the class the story of Goldy. To review, draw two groups of dots on the board.



Ask a student to come up and draw Goldy's mouth. After doing a few more examples announce that from now on, instead of drawing dots for the fish, you will write a numeral to show how many fish there are in each school. Put an example on the board.

7 5

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Point to "7".

T: How many fish are there in this school? (Seven)

Point to "5".

T: How many fish are there in this school? (Five)
Who would like to show us the school of fish Goldy would eat?

Have the student draw Goldy's mouth.

T: Yes; Goldy is going to eat the school with more fish.

Point to the symbols as you read the number story.

T: Seven is more than five.
Five is less than seven.

Repeat this activity several times. Have the students read the completed number story each time.

For example,

$2 < 4$ Two is less than four.
Four is more than two.

$3 > 1$ Three is more than one.
One is less than three.

Write on the board:

4 $3 + 1$

Allow the students to discuss this situation briefly.

T: Goldy can't decide which school of fish to eat because four fish is the same as three fish plus one fish. We will put an "equals" sign between the numerals (do so). Now, who can read this number story?

S: Four is equal to three plus one.

Repeat this activity several times. Ask the class why Goldy prefers the chosen school of fish, and have the students read the completed number story each time. For example,

$$6 > 2 + 2$$

T: Why do you think Goldy would eat the school with six fish?

S: 2 + 2 = 4, and 6 is more than 4.

The number story can be read:

"Six is more than two plus two";

or

"Two plus two is less than six".

Another example of this activity is the following.

$$4 + 1 < 10$$

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T: Why do you think Goldy would eat the school with ten fish?

S: 4 + 1 = 5, and 10 is more than 5.

The number story can be read:

"Four plus one is less than ten";

or

"Ten is more than four plus one".

Worksheets F25.2* and ** are available for the remainder of class time.

Name ____________________ F 25.2 *

Write <, >, or =.

8 < 10

7 < 9

3 < 6

5 = 5

10 > 2

4 > 1

5 < 8

Name ____________________ F 25.2 **

Write <, >, or =.

1+1 < 3

2 < 2+1

2+3 = 5

2+3 > 1

6 = 2+4

9 > 8

6+3 > 6+1

F 26

F26 The Numbers Speak #1

CAPSULE LESSON SUMMARY

Review the relations "more than" and "less than". Investigate the relation "is less than" in several arrow picture situations.

MATERIALS

Teacher: Colored chalk
Student: Colored pencils; unlined paper

DESCRIPTION OF LESSON

Exercise 1

Tell your class that you are going to play a game and that they should not answer unless you point to them. Below is a sample dialogue.

T:	3 is less than. . .	S:	5
	5 is less than. . .		9
	9 is less than. . .		10
	10 is less than. . .		11
	11 is less than. . .		12
	12 is less than. . .		19
	19 is less than. . .		50
	50 is less than. . .		100
	100 is less than. . .		200
	200 is less than. . .		1,000,000
	1,000,000 is less than. . .		1,000
	No, 1,000,000 is not less than 1,000.		
	1,000,000 is less than. . .		2,000,000

If your students begin to give consecutive numbers, you should give a skip count to encourage them not to restrict themselves. You may want to have a student write one of the larger numbers on the board or to write one of them yourself if none of the students is able. When you think you should not continue this type of game, change it to an "is more than" game.

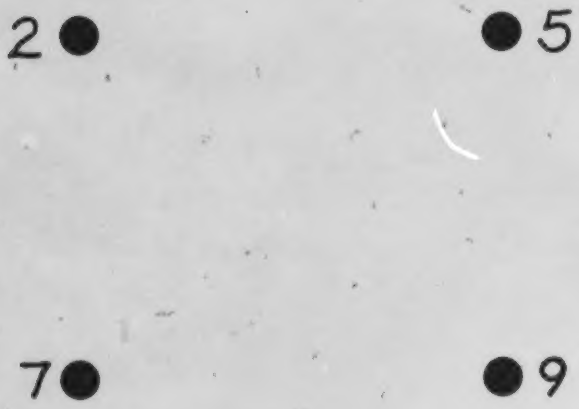
T:	Now listen carefully.		
	2,000,000 is more than. . .	S:	1,000,000
	1,000,000 is more than. . .		100
	100 is more than. . .		50
	50 is more than. . .		40
	40 is more than. . .		30
	30 is more than. . .		25
	25 is more than. . .		1
	1 is more than. . .		0

Continue this activity for five or ten minutes. If you prefer the words "smaller" and "larger", to "less" and "more" respectively, feel free to substitute them throughout the lesson.

Exercise 2

Draw and label the dots as you tell this story.

T: Once upon a time, there were four numbers. One of the numbers was 2; another was 5; and the other two were 7 and 9.

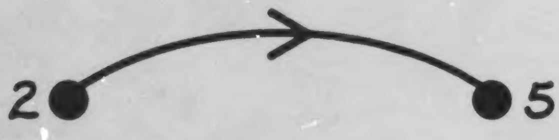


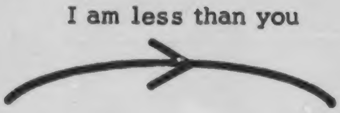
F 26

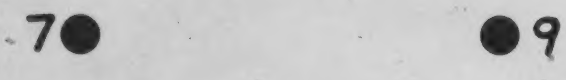
T: 2 looked at 5 and said. . .
What could 2 say?
Should it say "I am less than you" or "I am more than you"?

S: "I am less than you."

Draw a key arrow for "is less than" and the arrow showing "2 is less than 5".







Trace the arrow as you say, "2 is less than 5."

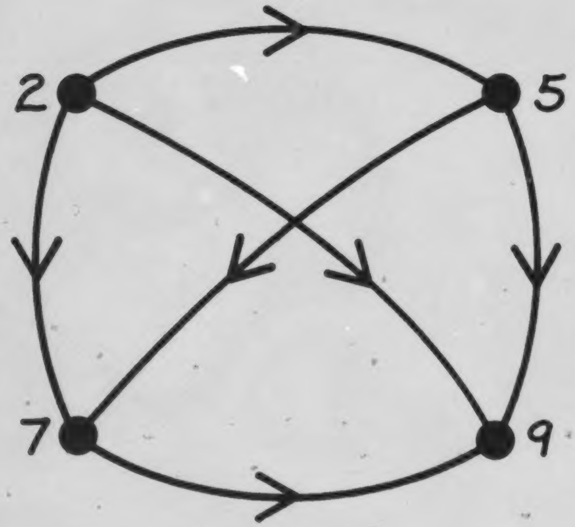
T: Can we draw any more red arrows? (Yes)
Who would like to show us a red arrow from some number which can say "I am less than you" to another number?

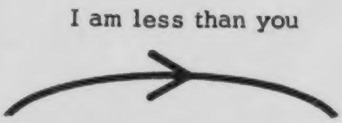
Have a volunteer trace an arrow. If it is traced correctly, draw it yourself. After the arrow has been drawn, trace it saying, for example, "2 is less than 7."

Continue allowing the students to trace arrows (or to draw them, if you prefer) for "I am less than you". After each arrow has been drawn, you should trace it and tell what it means, or ask a student to tell what is being said via the arrow.

If a student suggests an incorrect arrow, you should tell what is being said via that arrow; for example, "7 is less than 5." This will probably cause your class to protest and the error will be corrected. If the student has traced an arrow correctly but has difficulty with the direction, you may wish to trace the arrowhead for the student or even draw the arrow lightly on the board.

Continue until all the arrows have been drawn.



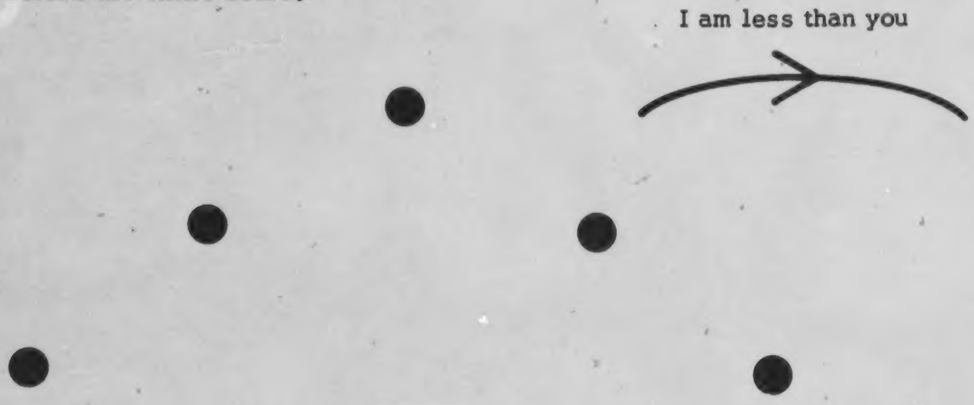


T: Which number speaks to all the other numbers? (2)
Which number cannot speak to any other number here? (9)
How many numbers does 5 speak to? (Two)

F 26

Exercise 3

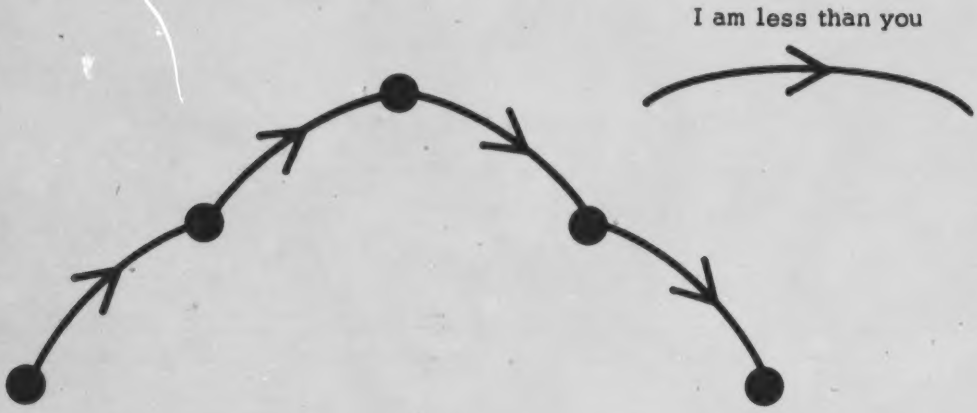
Erase the board except for the key arrow. Draw five dots, spreading them out across the entire board.


I am less than you

T: These dots are numbers.
How many numbers? (Five)
Do we know which numbers they are? (No)

T: These numbers have said, "I am less than you."

Draw these arrows in your picture.


I am less than you

T: Which of these numbers is the smallest?

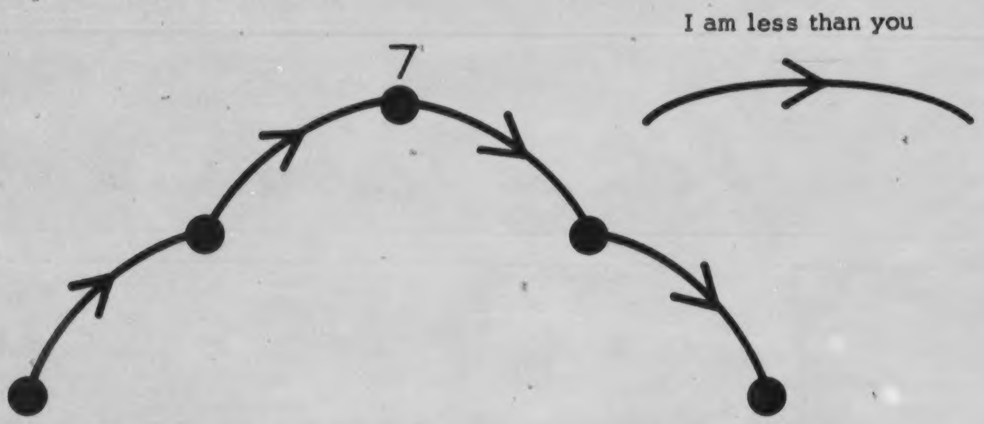
The students should point to the last dot on the left.

T: Which of these numbers is the largest?

The students should point to the last dot on the right.

T: Let's see which numbers these could be.
Who would like to label a dot?

Make it clear that a student can pick any dot and any number. Point to that dot. The following dialogue is only a sample (since we cannot predict what the first student will do).

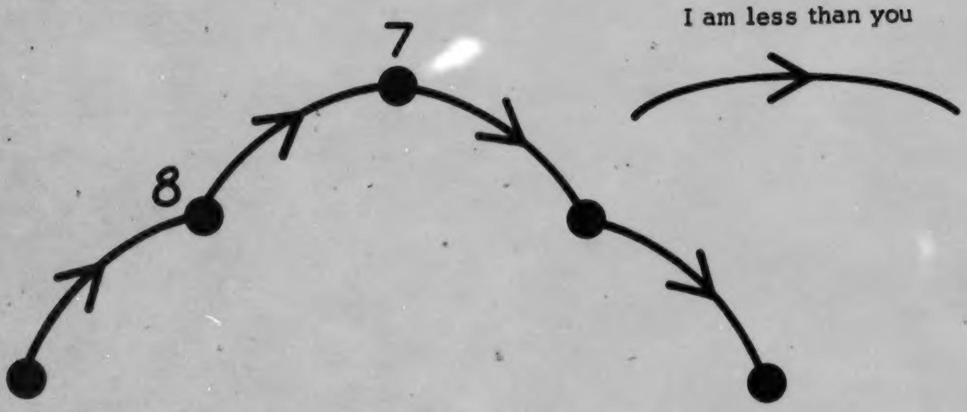


T: If this number were 7, what could these other numbers be?

Have another student come up and label a dot. If the student is incorrect, let the class find and correct the mistake.

F 26

For example,


I am less than you
7
8

T: What is 8 saying to 7?

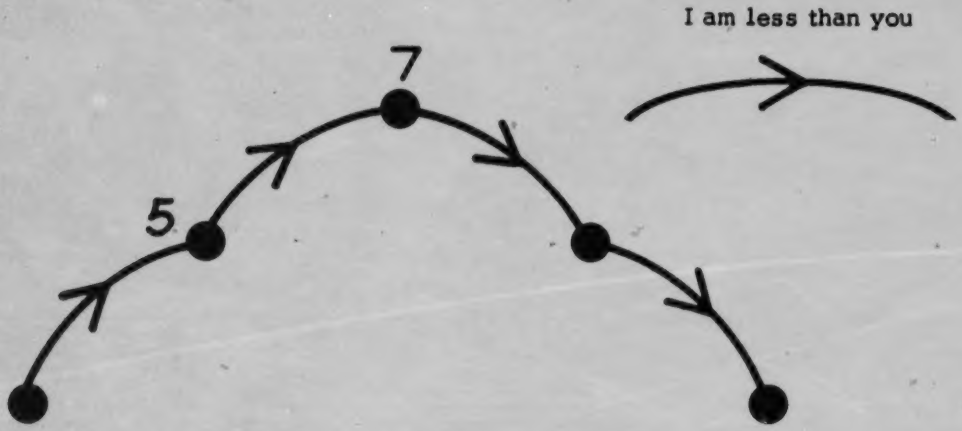
S: "I am less than you."

S: 8 isn't less than 7!

T: Correct. That number cannot be 8 because 8 is not less than 7.

Erase the "8" from the arrow picture.

T: What could these other numbers be?


I am less than you
7
5

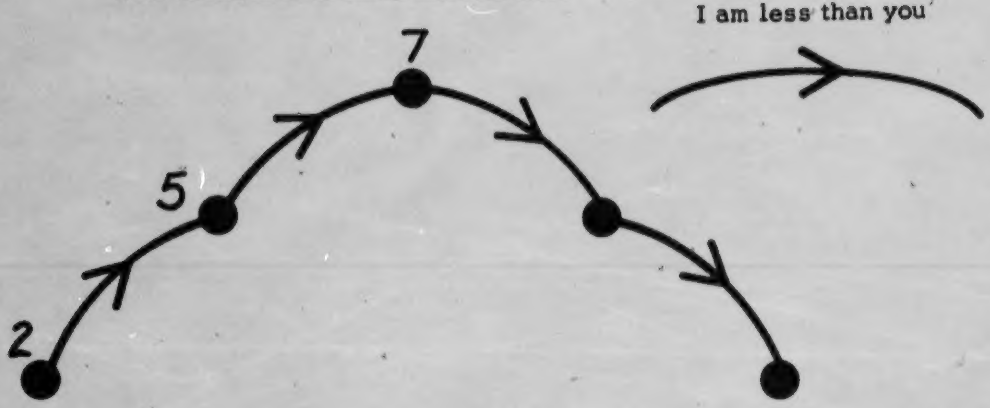
T: What is 5 saying to 7?

S: "I am less than you."

T: Yes. 5 is less than 7.

Point to the "5".

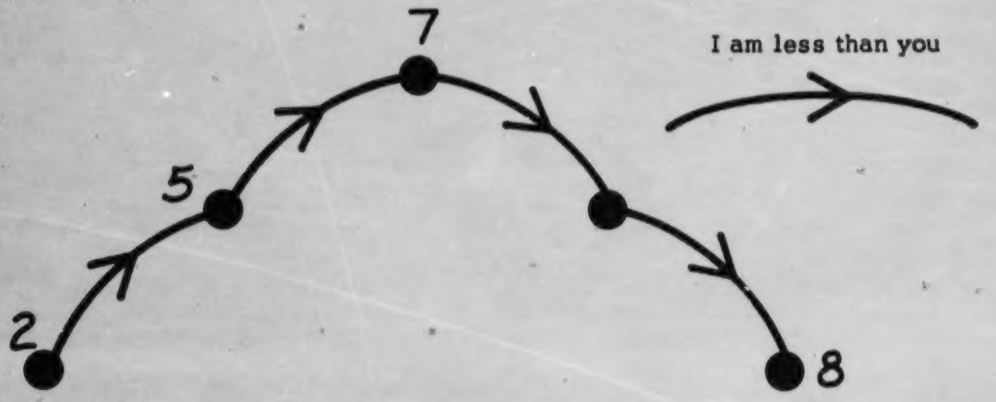
T: Could this number be 5? (Yes)
Who would like to label another dot?


I am less than you
7
5
2

Point to the "2".

T: Could this number be 2? (Yes)
How do you know? (2 is less than 5)

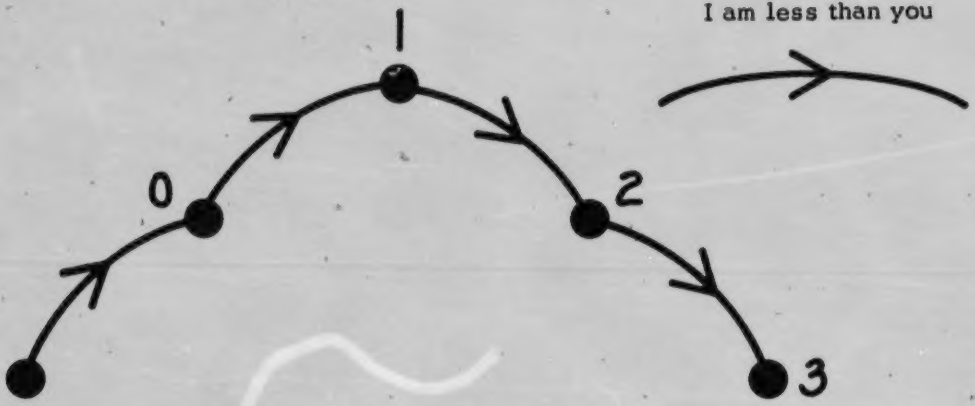
NOTE: It is possible for situations to develop which would require the use of numbers other than the whole numbers. For example,


7
I am less than you
5
2
8

F 26

Most first graders will not be aware of any numbers which are both more than 7 and less than 8. They will probably conclude that there is no number between 7 and 8. In this case you should say, "You don't yet know any numbers which are between 7 and 8," and erase the "8". If a student suggests a number which is between 7 and 8, such as $7\frac{1}{2}$, accept this answer as correct but do not emphasize it.

Here is another example of such a situation.



Most first graders will not be aware of any numbers which are less than 0. They will probably conclude that there are no numbers less than 0. In this case you should say, "You don't yet know any numbers which are less than 0," and erase all the numerals. If a student suggests a number which is less than 0, such as some negative number, accept the answer as correct but do not emphasize it.

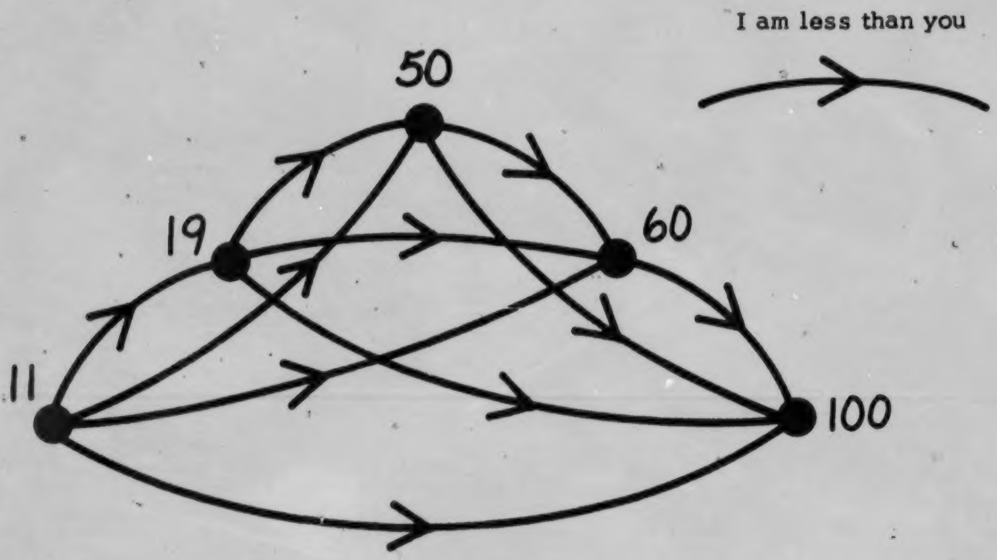
Repeat this activity two or three times.

Exercise 4

Do not erase the board after Exercise 3. Use the last arrow picture, complete with labels, for this exercise.

T: Look very carefully at this arrow picture. Could we draw any more red arrows? Remember that the red arrows are for, "I am less than you".

Ask volunteers to come to the board and trace red arrows. If an arrow is traced correctly, either you or the student should draw it on the board. You may want to ask some of your students to tell what a particular arrow means. The arrow picture below shows all of the red arrows which can be drawn. Do not insist that your class find all of these arrows.



Erase the board and distribute unlined paper and colored pencils. Ask that the students draw five dots on their papers. Tell them that they may choose any numbers they like for these dots. While they are labeling their dots draw a key arrow for "I am less than you", on the board in whatever color the students will be using. Ask the students to draw as many arrows as possible.

Students who finish quickly could draw another arrow picture on the back of their papers with six numbers.

F 27

F27.1 0-109 Numeral Chart #1

CAPSULE LESSON SUMMARY

Use the 0-109 Numeral Chart to practice reading numerals, to do some counting exercises, and to explore some number patterns.

MATERIALS

Teacher: 0-109 Numeral Chart
Student: None

DESCRIPTION OF LESSON

NOTE: During and after this lesson, the 0-109 Numeral Chart should be on display in the classroom.

Many exercises are possible. Try to choose some that are challenging to your class. Continue as long as student interest remains high.

You could ask your students to

- read a given column. What do you notice? (All the numbers end with the same digit.)
- read a given row. What do you notice? (All the numbers start with the same digit.)
- read a column from bottom to top.
- read a row from right to left.
- start at "0" and read every other numeral (count by twos).
- start at "1" and read every other numeral (count by twos).
- count backward, starting with various numbers.
- find the numeral which you read.
- listen to you read the first row and tell how you are counting (by ones); do the same exercise with the second, fifth, and last rows.
- listen to you read the last column and tell how you are counting (by tens); do the same exercise with the first and fifth columns.

F27.2 +1 Spiral #1

CAPSULE LESSON SUMMARY

Use a spiral arrow picture and arrows for +1 to associate counting by ones and adding one.

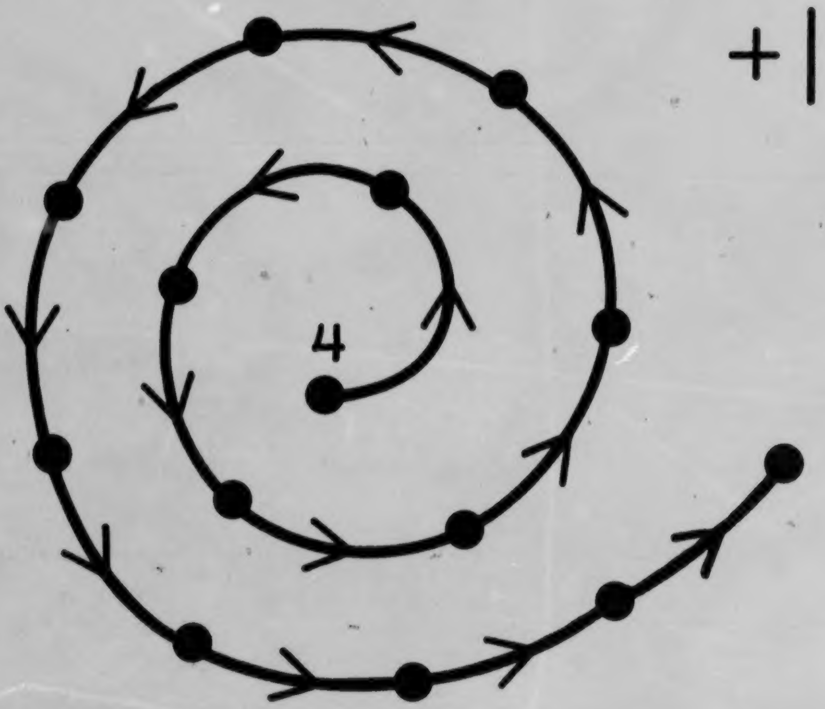
MATERIALS

Teacher: Colored chalk

Student: Worksheet F27.2* and **

DESCRIPTION OF LESSON

Draw a large spiral on the board. Use red chalk (or a color of your choice) for the arrows and white chalk for the dots. Write "+1" in red (or the color you are using) near the drawing. Label the first dot "4".



T: The red arrow is for +1. It tells us to add 1.

F 27

T (pointing to the dot labeled "4"): Hold up four fingers.

Now hold up one more finger.

How many fingers are you holding up all together?

S: Five.

T: Right - four plus one is five.

Using your left index finger, point to the first dot and using your right index finger, trace the arrow from "4" to the second dot. As you do this, say:

T: Four. . . plus one. . . is five.

T: Who would like to write "5" by this dot (point to the second dot)?

Point to "5" on the number line.

T: Five plus one (move one space to the right) is six.

On your spiral point to "5" and trace the next arrow from "5" to the third dot as you say:

T: Five. . . plus one. . . is six.

Have a student label the third dot "6", or do this yourself.

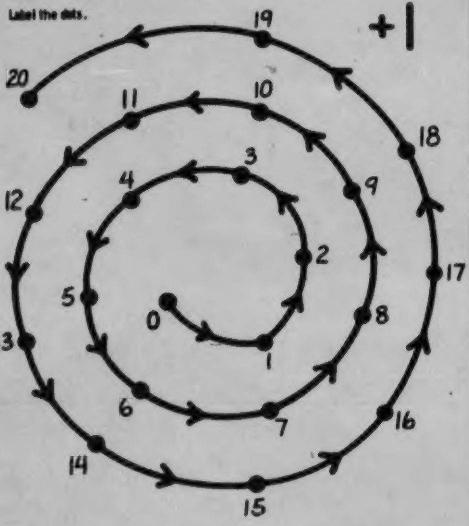
Continue, using a combination of these methods, to label the rest of the dots.

Erase the board and distribute Worksheets F27.2* and **. Students who finish labeling the dots on the * worksheet should turn it over and label the dots on the ** worksheet.

Name ____________________

F 27.2 *

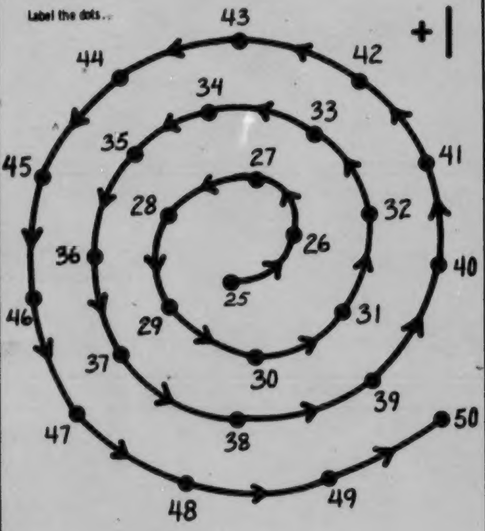
Label the dots.


+1
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

Name ____________________

F 27.2 **

Label the dots..


+1
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50

228

F 28

F28.1 Minicomputer Introduction #3

CAPSULE LESSON SUMMARY

Review representing numbers from 1 to 10 on the Minicomputer and continue by showing some other numbers less than 20 on the Minicomputer. Introduce some new plays on the Minicomputer.

MATERIALS

Teacher: Demonstration Numeral Cards, Minicomputer set
Student: None

DESCRIPTION OF LESSON

Either have the numeral cards with the numerals "0" - "10" on hand for this lesson or have a pointer available so you can point to the numeral cards.

Exercise 1

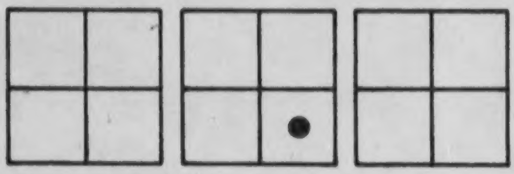
Display three Minicomputer boards. Tell the students that you are going to put some numbers on the Minicomputer and that they are to tell you, with their fingers, which numbers these are. Briskly, review 2, 4, 1, 8, 3, 6, 9, 7, and 10 on the Minicomputer. For each number, after the students have had an opportunity to show you the number with their fingers, call on a student to answer verbally.

Tell your students that you are going to hold up (or point to) a numeral card and that you will choose a volunteer to put that number on the Minicomputer. Accept non-standard configurations as correct, but ask if someone could show that number with fewer checkers. Continue asking for someone to show the number with fewer checkers until you get the standard configuration.

If someone puts the wrong number on the Minicomputer, the students should hold up both of their hands in silent protest. In this case you should say, "No, this isn't ____; this number is ____," and ask one of the students who protested to put the correct number on the Minicomputer. Always remove the checkers from the Minicomputer before you proceed to another number. Show each of the numbers from 0 to 10 once, in a random order.

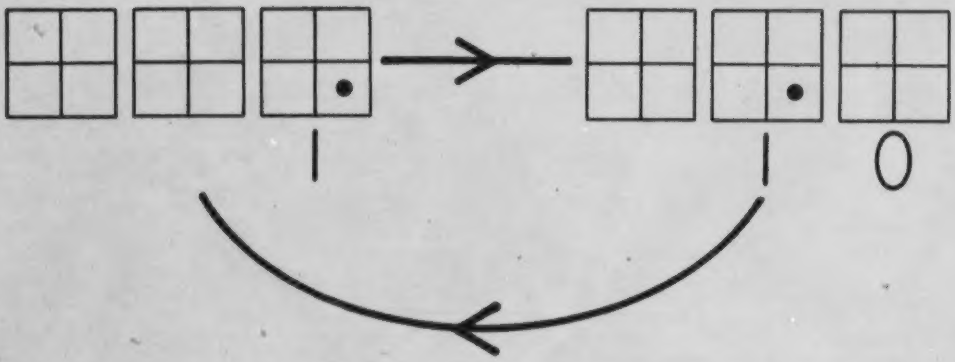
Exercise 2

Put this one checker on the Minicomputer.



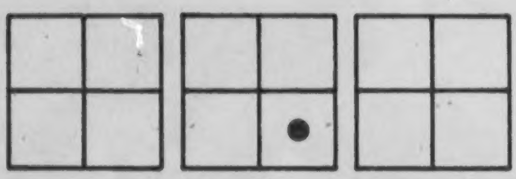
T: What is this number? (10)

Move the checker quickly back and forth from the white square of the tens' board to the white square of the ones' board. As you do this, have the class say, "Ten - one - ten - one - ten."

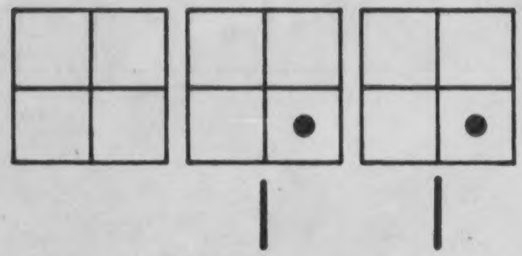


F 28

Be sure to end with the checker on the tens' board.



T: If I give you one more checker, who could put 11 on the Minicomputer? Who would like to write "11" below (or above) the Minicomputer?



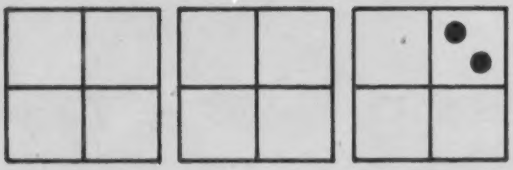
If the numerals are not written clearly below the boards, you should rewrite "11" yourself with a "1" below the ones' board and the tens' boards. Remove the checker from the ones' board and repeat this activity with 12, 14, and 18. Try to make obvious the relationship between the Minicomputer boards and the written numeral.

T: Who can put 13 on the Minicomputer?

If your class is interested and is enjoying the lesson, continue with Exercise 3.

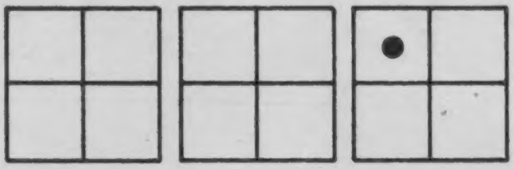
Exercise 3

Put two checkers on the Minicomputer.



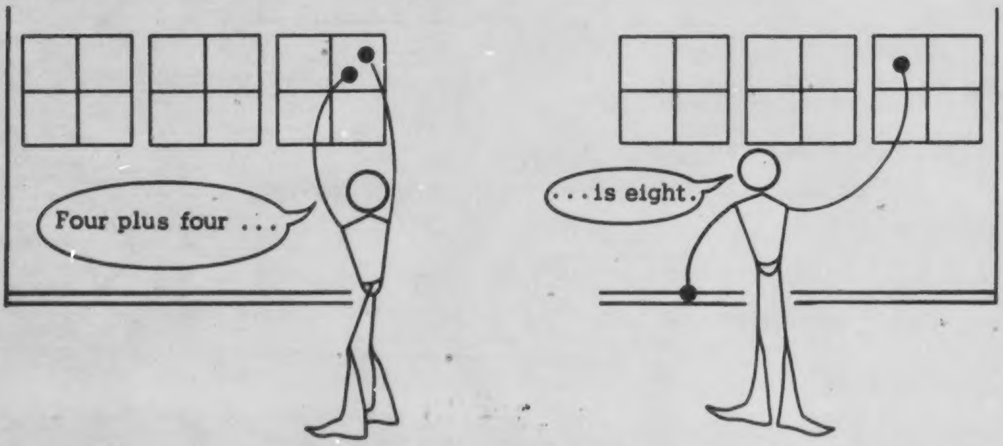
T: What is this number? (8)

This is 8 with two checkers. Who can show 8 with just one checker?



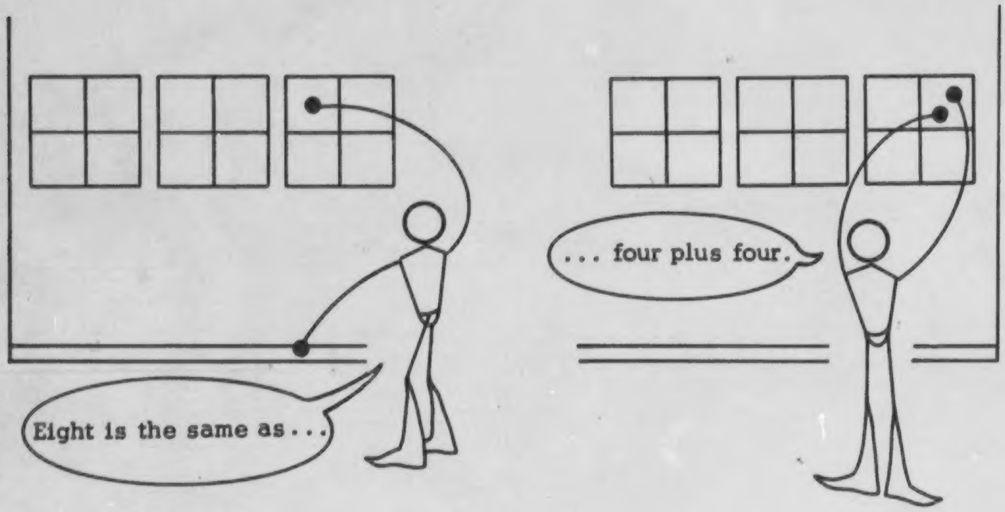
After 8 has been put on the Minicomputer with one checker, repeat the play yourself as dramatically and obviously as possible.

First, pick up the two checkers on the purple square of the ones' board. Be sure to use both hands with one checker in each hand. As you pick them up say, "Four plus four is eight." Then put one of the checkers on the brown square of the ones' board and put the other checker away.

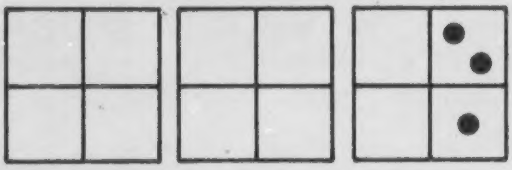

Four plus four ...
...is eight.

F 28

Pause a second and then pick up the checker on the brown square and say, "Eight is the same as four plus four." While you are speaking, pick up another checker with your empty hand and put both checkers on the purple square.


Eight is the same as . . .
. . . four plus four.

Put this configuration on the Minicomputer.



T: What number is this? (9)
How do you know? (8 + 1 = 9 or 4 + 4 + 1 = 9)
Could someone show us how to show 9 with only two checkers?

After a student has put the standard configuration for 9 on the Minicomputer, you should demonstrate the "8 = 4 + 4" and "4 + 4 = 8" plays again.

F28.2 Hidden Dots #2

CAPSULE LESSON SUMMARY

Cover some dots in a pattern of dots and determine the number of hidden dots. Hide different numbers of dots to explore various representations of a number. Write number stories for these different representations.

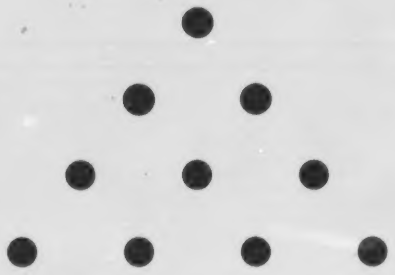
MATERIALS

Teacher: Heavy paper or cardboard

Student: None

DESCRIPTION OF LESSON

Draw ten dots on the board. The dots should be large and clearly visible, yet you must be able to cover several dots with a sheet of paper.

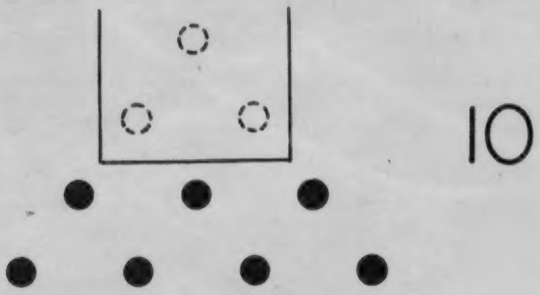


T: How many dots? (Ten)

Ask someone to write "10" on the board, then ask the students to close their eyes.

F 28

Hide some dots with a sheet of paper and ask your students to open their eyes again.

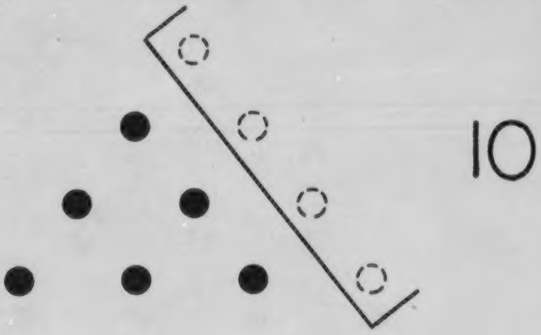


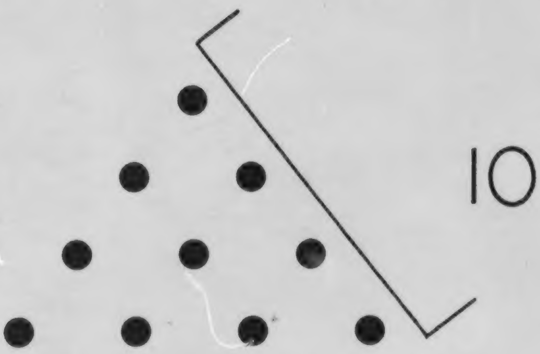
T: How many dots can you see? (Seven)

How many dots are hidden? (Three)

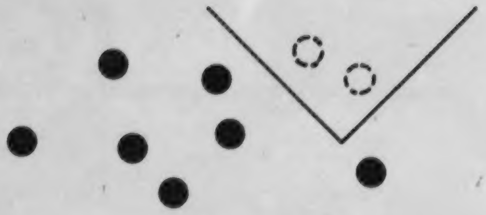
Write "10 - 3 = 7" and "7 + 3 = 10" on the board.

Repeat this activity several times at a brisk pace. Use the following examples or any similar arrangement.





Variation: Draw the dots so that they do not form a symmetric pattern.



9

F 29

F29 One Out of Seven

CAPSULE LESSON SUMMARY

Use the languages of strings and arrows to tell a story about a family of dogs.

MATERIALS

Teacher: One copy of the storybook "One Out of Seven"

Student: One copy of the storybook "One Out of Seven" for each pair of students

DESCRIPTION OF LESSON

This story about a family of dogs not only uses the powerful mathematical languages of strings and arrows, but also deals with number recognition and can be used as a light, first introduction to addition.

For this story we advise you to pass out the storybooks at the beginning of the lesson so that your students can see the illustrations as you go along. Treat this story exactly as you would any other story you might read to your class. Many of the questions you might ask have already been included in the storybook itself. However, you may want to make note of the following points:

- As a general rule, make sure your students have enough time to look at the drawing on a page before you continue reading the story.
- Do not overemphasize the mathematical aspects of the story.

Page 2

Pause after "What has happened?" to give your students the chance to compare the two dot pictures, and perhaps notice, on their own, that one dog is missing.

Page 3

Do not force the students to count the dots in each string if they recognize, without counting, how many there are.

Pages 3, 4, and 8

As you read the number stories on each of these pages, have the students illustrate them with their fingers.

When you have finished reading the story, do not rush the class into another activity. Allow them time to talk about or draw pictures having to do with the story. Your students would enjoy it greatly if they were able to have a copy of the storybook to keep. This can be arranged if your school is prepared to buy enough additional copies of the book so that each student may have one. However, if it is not the intention of your school to purchase a new set of storybooks each year, collect the storybooks so that they may be reused next year. Do, however, give your students ample opportunity to look through them.

There is a narration tape* available for the story "One Out of Seven". On some other occasion, you could listen to it as a class or you could let the students listen to it individually at any time during the year. In any case, at least one copy of the storybook (with or without the accompanying tape) should be available for students who wish to look at it again in their spare time.

---

*This tape may be obtained by sending a blank 30-minute cassette tape to CEMREL-CSMP. The recorded tape will be returned to you free of charge. Be sure to mention the title of the story in your request for the tape to be recorded, and include a stamped, self-addressed envelope.

F 30

F30 Adjustment Day #3

NOTE: See the General Introduction, p. 16 for a full explanation of the purpose of scheduled adjustment days.

On this day, you may wish to repeat a previous lesson either for a group of students, or for the entire class. Many of the lessons can be made to appear completely different by changing the story or the numbers in the lesson. Lessons which you may wish to repeat include the following.

F16.2	A Counting Snake
F17.1	Fingers
F23.1	Brother-Sister Graph #2
F23.2	Counting Activity #1

If you omitted any of the exercises in Minicomputer Introduction #1, #2, or #3, you may wish to pursue these exercises today.

This would also be a good time to allow the students to look at the storybook "One Out of Seven", if you have not already done so.

If your class is experiencing little difficulty with the CSMP curriculum you may wish to omit this adjustment day and continue immediately with F31 Walks on One-Way Roads #2.

The following game activities may be appropriate for students whose numerical readiness is weak.

Read My Mind

Choose an object in the room and offer clues to help the students determine which object you have in mind.

T: I am thinking of something in this room which can be rolled.

S: That piece of chalk.

S: The ball.

T: Now, I am thinking of a student who is sitting close to the window, is not a boy, and is wearing sneakers.

S: Susan.

Numeral Card Game

One student chooses a numeral card, from 0 - 10, and shows it to a second student. The second student should put this number on the Minicomputer. If this task is performed correctly, the second student gets to choose the next numeral card. If a mistake is made, the student who spots the mistake chooses next.

As the students become more adept with the Minicomputer, you can include more numeral cards in this activity.

EARLY WARNING !

Among the next nine classroom lessons are some which require extra preparation time, or which involve materials not included with the CSMP classroom set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (These special materials have been listed here only once, even if they are needed more than once during the nine-day period.)

F31 Walks on One Way Roads #2: pointer
F32.2 Guess My Rule with A-Blocks #2: loops of masking tape

F 31

F31 Walks on One-Way Roads #2

CAPSULE LESSON SUMMARY

Follow the arrows on a one-way road map to tour a zoo.

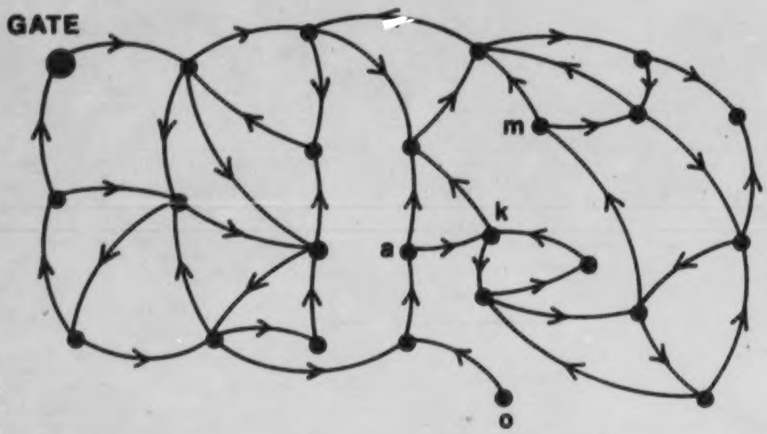
MATERIALS

Teacher: First Grade, Part I Poster #2; pointer; colored chalk

Student: None

DESCRIPTION OF LESSON

Tape the First Grade, Part I Poster #2 onto the board.



Do not yet label the dots on your poster. You will progressively label them during the lesson but for now, they are shown just to make the description of the lesson easier to follow.

T: This is the map of a zoo. The large dot is for the entrance gate to the zoo.

Label the large dot "GATE" as shown above.

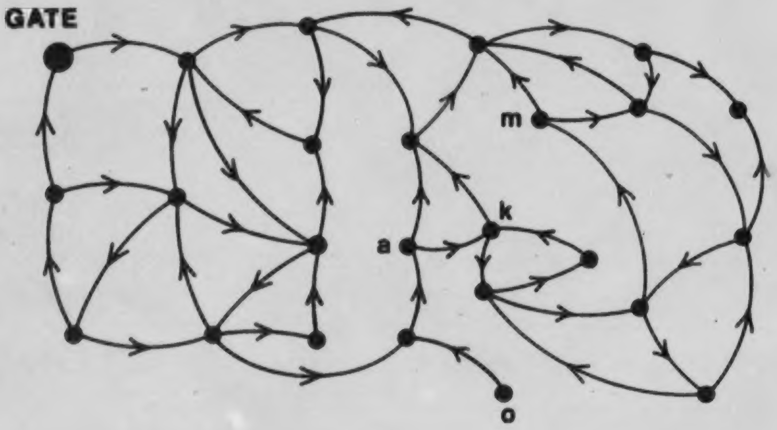
T: All the arrows are paths in the zoo. The paths are all one-way paths, and the arrows show which way you may walk on the paths.

Let the students discuss what are one-way roads or paths, and have several students use the pointer to "take" walks around the zoo, starting at the gate and walking until they reach a dead-end or become tired. As in Lesson F6.1, you may wish to involve the whole group by encouraging them to "protest" (by raising both arms) when someone walks against the arrows.

Point to the dot labeled "m" in the preceding illustration, and label it "m" on your poster.

T: The monkeys at this zoo live here. Their cage is called "Monkey Motel". Who would like to take a walk from the gate to the Monkey Motel?

Let several students "take" walks. Remind them when necessary that they may walk only in the direction of the arrows. There are several walks from the gate to Monkey Motel. When a student discovers one of them, ask if someone can find another way.

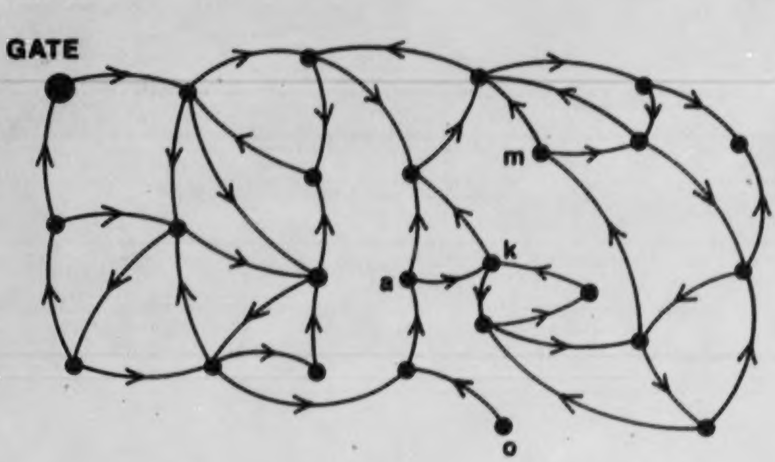


F 31

Point to the dot labeled "k" in the previous illustration, and label it "k" on your poster.

T: This cage is called "Kangaroo Castle". Which animals do you think live here?

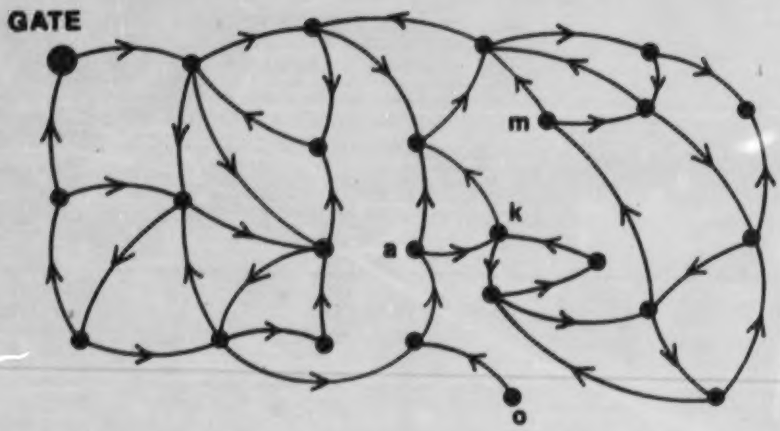
Ask some students to "take" walks from the Monkey Motel to the Kangaroo Castle; there are several correct walks.



Point to the dot labeled "a" in the illustration above and label it "a" on your poster.

T: This cage is called "Alligator Alley". How many of you have seen an alligator?

Ask several students to "take" walks from Kangaroo Castle to Alligator Alley.



Point to the dot labeled "o" in the illustration above, and label it "o" on your poster.

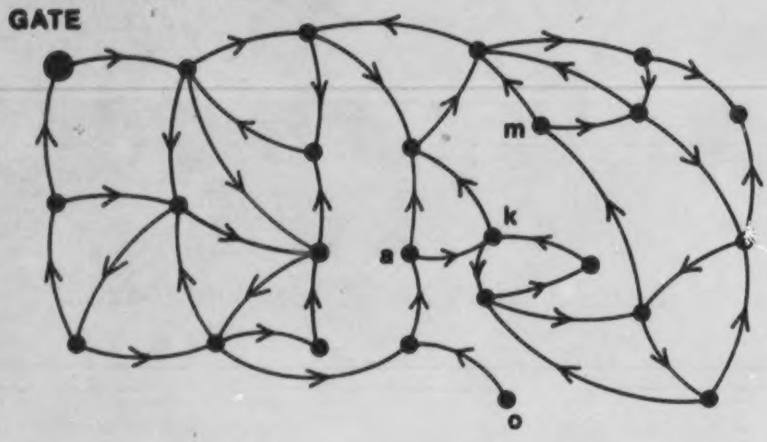
T: This cage is called "Ostrich Oasis". Who knows something about ostriches?

Let the students spend a minute or two discussing their experiences and then ask several students to find walks from Alligator Alley to Ostrich Oasis. There is no such walk because there is only a path directed away from Ostrich Oasis. See if a student can discover this and explain it.

T: Do you think the ostriches are unhappy because no visitors can come to their cage?

F 31

Finally, ask for walks from Alligator Alley to the gate; there are several possible walks.



F32.1 Minicomputer Introduction #4

CAPSULE LESSON SUMMARY

Review representation of the numbers from 0 to 10 on the Minicomputer and introduce the "1 + 1 = 2" and "2 = 1 + 1" plays on the Minicomputer.

MATERIALS

Teacher: Minicomputer set; Demonstration Numeral Cards
Student: None

DESCRIPTION OF LESSON

For this lesson, have the numeral cards with the numerals "0" to "10" at hand, or have a pointer handy so that you can point to the numeral cards.

Exercise 1

Display three Minicomputer boards. Tell the students that you are going to put some numbers on the Minicomputer and that they are to tell you, with their fingers, which numbers they are. Briskly review 2, 4, 1, 8, 3, 7, 9, and 10 on the Minicomputer.

Tell the students that you are going to hold up (or point to) a numeral card, and that you will choose a volunteer to put that number on the Minicomputer. Accept non-standard configurations as correct, but then ask if someone else could show the number with fewer checkers. Continue to ask for someone to use fewer checkers until the standard configuration is presented.

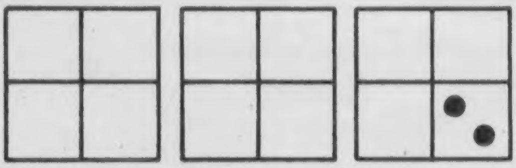
If someone puts the wrong number on the Minicomputer, the students should hold up both of their hands in silent protest. In this case you should say, "No, this number is not ____; this number is _____," and ask one of the students who protested to put the correct number on the Minicomputer.

F 32

Try to include all the students in this activity. Always remove all checkers from the Minicomputer before proceeding to another number. Show each of the numbers from 0 to 10 once, in a random order.

Exercise 2

Put two checkers on the Minicomputer.



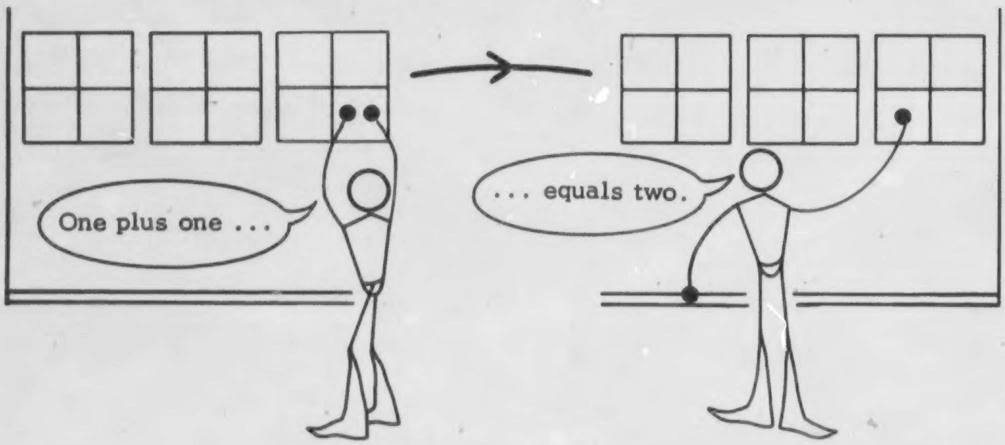
T: What is this number? (2)

How do you know?

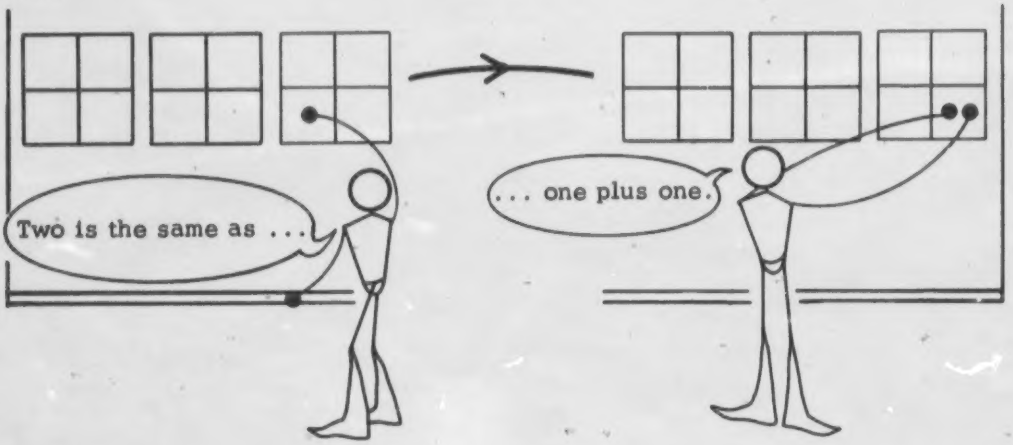
The best response to this question is "because 1 + 1 = 2". If necessary, hold up one finger on each hand and say, "One plus one is two." Then return to the Minicomputer and repeat, "One plus one equals two," lifting each checker briefly as you speak.

T: Can anyone show us another way to put 2 on the Minicomputer?

Be prepared to make the play yourself if no student volunteers. In any case, you should demonstrate this "play" very dramatically and obviously after the play is first shown. Use both hands to make the play, as illustrated on the following page. First, pick up the two checkers from the white square and say, "One plus one is two." Then, put one of the checkers on the red square of the ones' board and put the other checker away.


One plus one . . .
. . . equals two.

Pause briefly and then pick up the checker from the red square and say, "Two is the same as one plus one." While speaking, put this checker and another one onto the white square of the ones' board.


Two is the same as . . .
. . . one plus one.

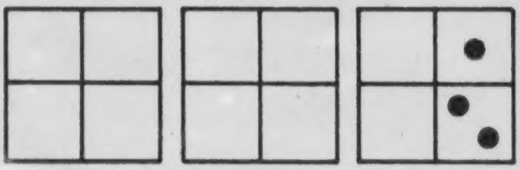
Demonstrate the "1 + 1 = 2" play again.

If the class is interested and is enjoying the lesson, continue with Exercise 3.

F 32

Exercise 3

Remove all checkers from the Minicomputer. This time, put the checkers on the Minicomputer more slowly so that the students may mentally calculate the number. First, put one checker on the purple square of the ones' board--pause; put one checker on the white square--pause; and put a second checker on the white square.



T: What number have I put on the Minicomputer? (6)
How do you know? (4 + 1 + 1 = 6)

Demonstrate this fact with your fingers.

T: Who knows a way to put 6 on the Minicomputer with fewer checkers?

If a student attempts to make the play, assist by saying, "One plus one is two." If a student does not make the play, do not insist on it. In any case, after 6 has been shown with two checkers, you should very dramatically demonstrate the "2 = 1 + 1" and "1 + 1 = 2" plays again.

F32.2 Guess My Rule with A-Blocks #2

CAPSULE LESSON SUMMARY

Place a sequence of A-blocks on the board, according to a secret rule. Challenge the class to guess the secret rule.

MATERIALS

Teacher:	One set of A-blocks; loops of masking tape
Student	None

NOTE: If you have a magnetic board, you may wish to use a set of A-blocks which you have "magnetized" with the adhesive magnetic material provided with the A-Block String Game kit. If you use masking tape instead, make sure the board is as clean as possible (for good adhesion).

DESCRIPTION OF LESSON

T: I'm going to put some A-blocks on the board. Each time I put one up it will follow a rule. See if you can guess what the rule is.

The first rule should be based on color. Try a pattern such as: yellow, yellow, yellow, blue---yellow, yellow, yellow, blue--- and so on. The size and shape of the pieces are irrelevant. The rule is "three yellows, one blue".

After two or three pieces have been placed on the board, encourage the students to guess which piece could be the next one.

If a student suggests a piece that follows the rule, say:

T: Yes; that piece could be next.

F 32

If a student suggests a piece that does not fit the pattern, say:

T: That piece does not fit my rule. You may be thinking of a different rule.

Emphasize with the students that their rules are as "good" as yours, but in this game they must try to discover your rule.

When students think they have discovered the rule, ask them to whisper it to you; students who have found the rule could be the judges for the others' choices. When you feel that most of the class knows your rule, let someone announce it aloud.

Remove all A-blocks from the board and begin again with a new rule. One rule which is especially challenging is: big, little---big, little--- and so on.

F33 Two Sets #1

CAPSULE LESSON SUMMARY

Use a string picture to classify the family cars of class members.

MATERIALS

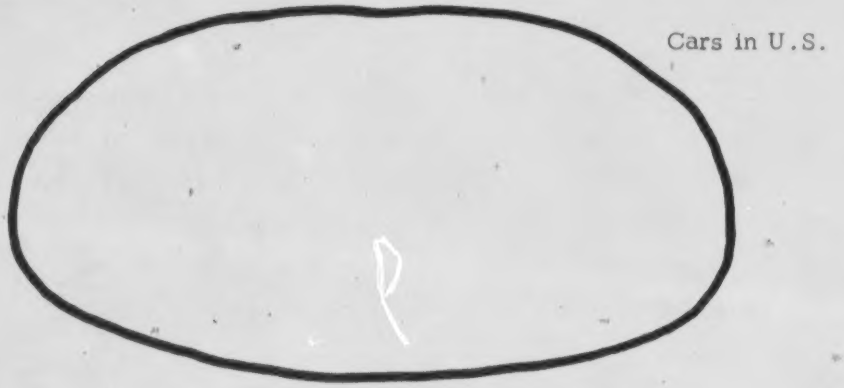
Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

NOTE: Try to keep a brisk pace in the first two parts of this lesson (at least until p. 251).

Draw a large string in blue on the board and label it as shown.



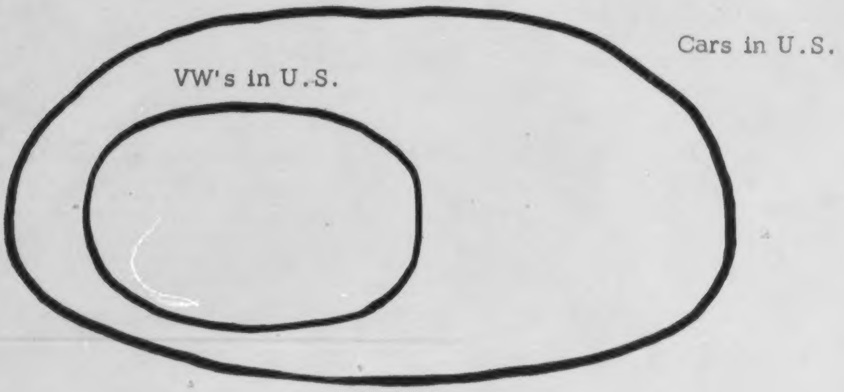
T: This string is for all the cars in the United States.
Who would like to draw a dot for their family car?

Let two or three students place dots for their family cars.

F 33

Also ask several students to draw dots for things which belong outside of the string; for example, a dot for a car in Europe, or a bicycle, or a horse, or a number, none of which are cars in the United States.

Erase all the dots and draw a red string for all the VW's in the United States. The red string should be entirely within the blue string as shown.



Once again, ask several students to draw dots for their family cars. If it is a VW it must be inside the red string. If the car is not a VW, it must be outside the red string but inside the blue string. If no one's family has a VW, ask a student to draw a dot for a VW owned by a friend of yours.

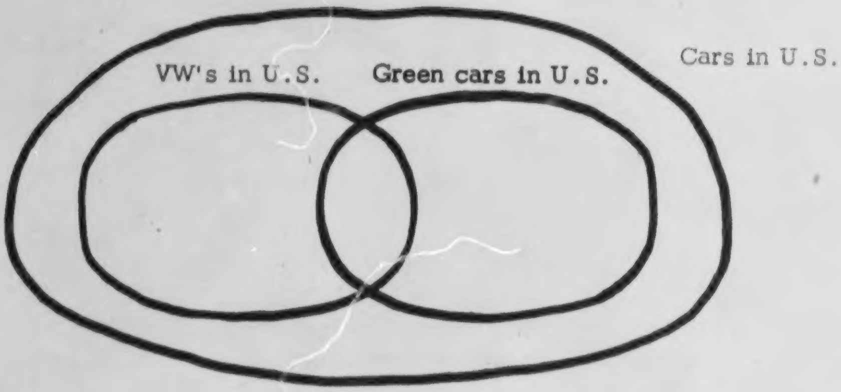
Ask again about dots for some things that belong outside the blue string.

Erase the dots but let the strings remain.

T: Who can trace a string for all the green cars in the United States?

When a student has traced the string correctly, use a third color of chalk to draw the string yourself.

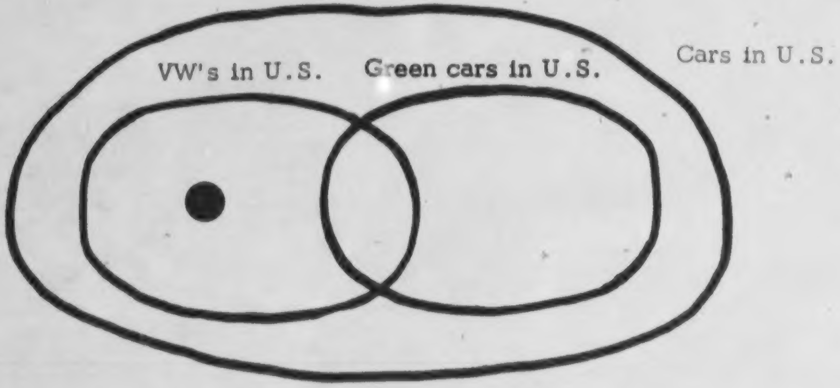
The correct answer is:


VW's in U.S.
Green cars in U.S.
Cars in U.S.

If an incorrect answer is given, see "COMMENT" at the end of this lesson (p. 255) for ways to handle the response. Once the correct answer has been found, draw the string yourself and proceed.

Ask several students to come to the front of the class, tell the kind and color of their family cars, and draw dots for them. Try to include a green VW, even if you have to say your friend's VW is green.

Again erase all dots but let the strings remain. Draw a dot as follows.


VW's in U.S.
Green cars in U.S.
Cars in U.S.

F 33

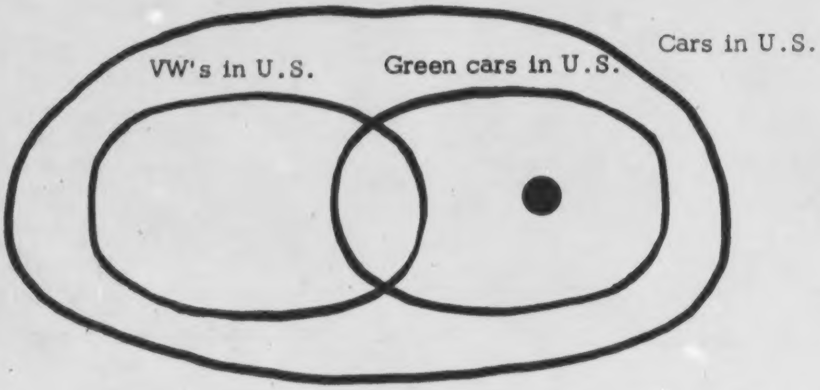
T: What could this dot be for?

S: A VW.

T: A green one?

S: No.

Erase the dot and draw a new one.

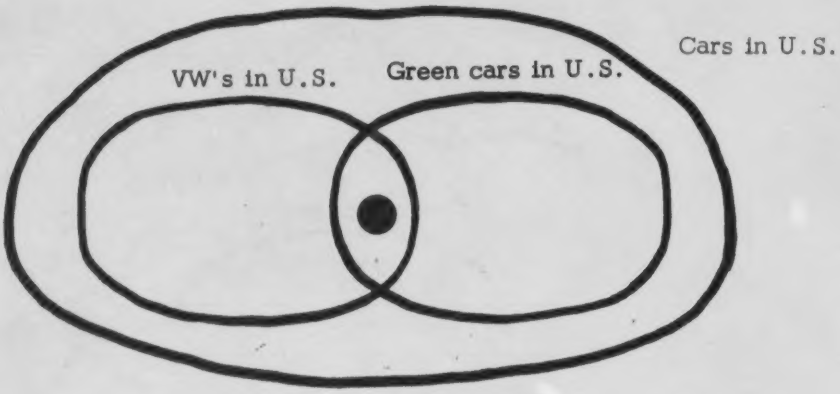

Cars in U.S.
VW's in U.S.
Green cars in U.S.

T: What could this dot be for?

S: A green car.

S: But not a VW.

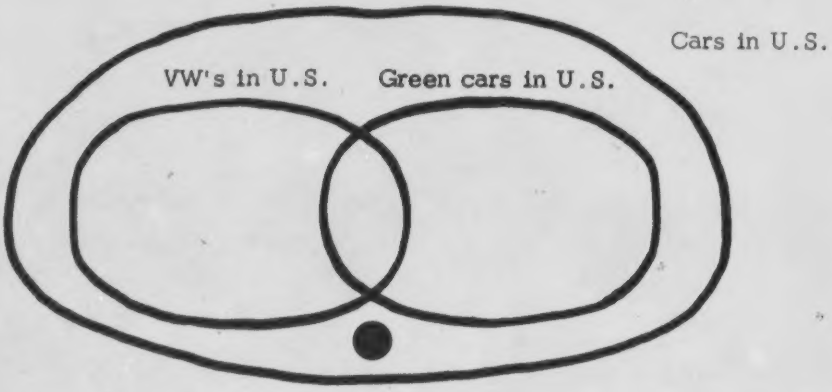
Erase the dot and draw this one.


Cars in U.S.
VW's in U.S.
Green cars in U.S.

T: How about this dot?

S: A green VW!

Erase the dot and draw one in a different region.


Cars in U.S.
VW's in U.S.
Green cars in U.S.

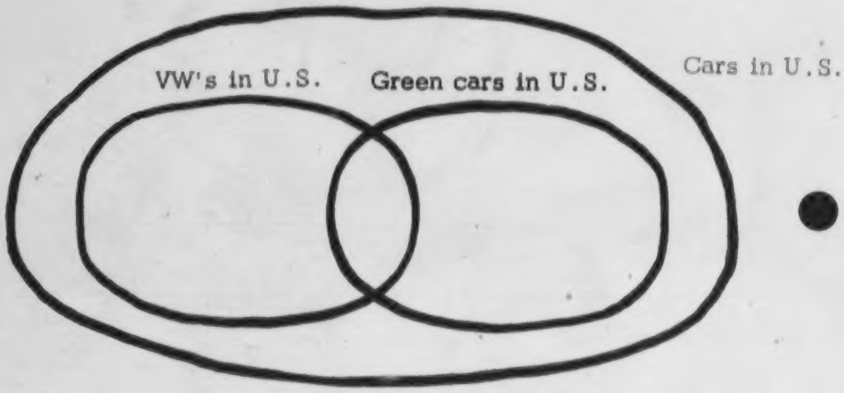
S: A yellow Ford.

S: A blue Plymouth.

F 33

T: Could the car be green? (No)
Could it be a VW? (No)

Erase the dot and draw a dot in the outside region.



S: A car outside the U.S.

S: A horse.

S: My desk.

Erase the dot but let the strings remain.

T: I am thinking of a car and you must decide where to draw the dot for it in this picture. You may ask me questions but I can only answer either "yes" or "no".

There are three useful questions:

- Is the car in the U.S.?
- Is it green?
- Is it a VW?

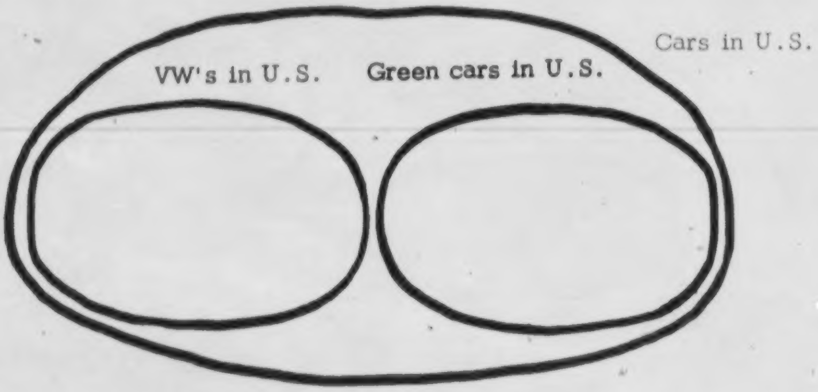
When one of these questions is asked, give the answer and mention that this should help to locate the car in our picture. Answer other questions without comment. When the students have enough information to locate the car, let one of them draw the dot for it.

COMMENT

Dealing with incorrect placement of the black string:[*]

Below are several possible incorrect answers and ways to respond to them. Keep in mind that sometimes one incorrect answer will be simply replaced by another one and you should have ready responses for both.

The incorrect answer most often suggested is:



Ask if anyone disagrees with this answer and if so, why? If someone explains that there is no place to put a green VW, ask the student to trace a new black string. If no one suggests this explanation, suggest it yourself in the following way.

T: Who can draw a dot for a VW in the U.S.? (in the red string)

T: Who can draw a dot for a green Chevrolet in the U.S.? (in the black string)

---

[*] In this description, we refer to the string shown below, which is printed in black; on your chalkboard, of course, you have used white or some other color.

F 33

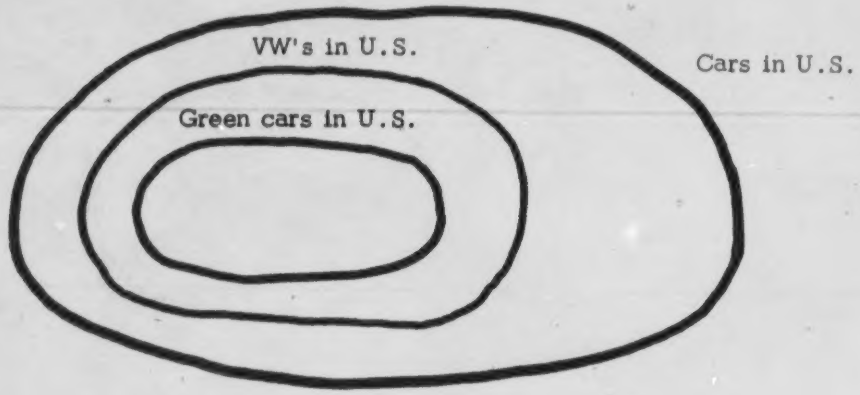
T: Who can draw a dot for a green VW in the U.S.?

S: There's no place for it!

Ask the students to suggest another placement of the black string.

Someone may suggest putting a dot (for a green VW in the U.S.) in the red string and also in the black string. Remind them that in our picture, each single thing may be shown with only one dot.

Another incorrect answer sometimes suggested is:

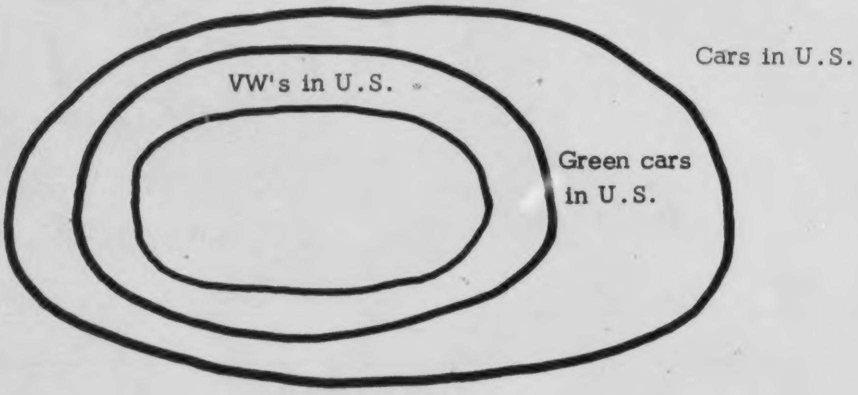


If no one disagrees with this, ask a student to draw a dot for each of the following:

- a yellow VW (inside the red but outside the black);
- a green VW (inside the black);
- a green Ford (impossible).

Ask the students to suggest another placement for the black string.

This would be another incorrect answer.

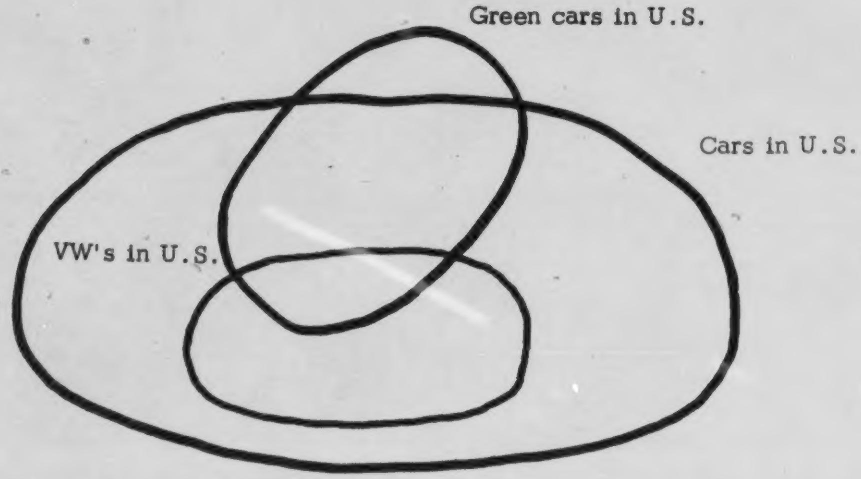

Cars in U.S.
VW's in U.S.
Green cars in U.S.

If no one disagrees with this, ask a student to draw a dot for each of the following:

- a green Chrysler (inside the black but outside the red);
- a green VW (inside the red);
- a black VW (impossible).

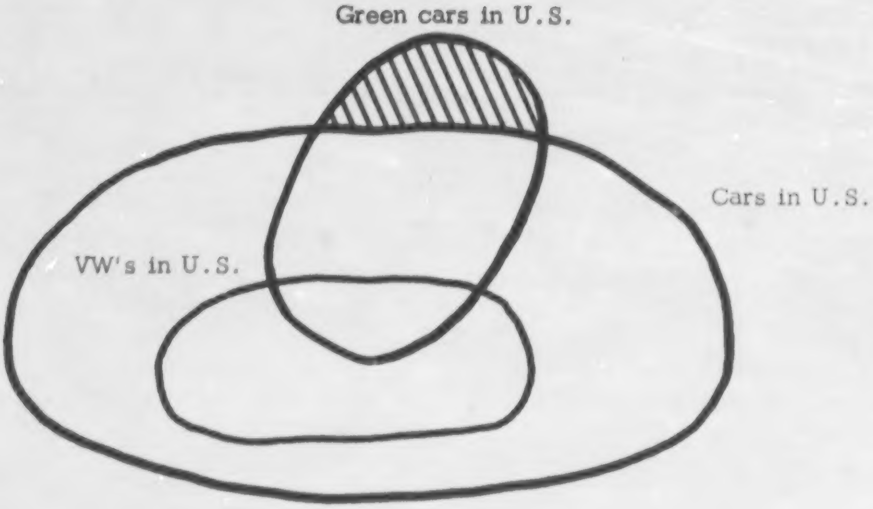
Ask the students to suggest another placement for the black string.

A solution like the following one is not really incorrect, but may not be completely understood.


Green cars in U.S.
Cars in U.S.
VW's in U.S.

F 33

T: This answer could be correct, but perhaps we should hatch this part of the picture to remind us that no dots may be drawn here; there are no green cars in the U.S. which are not cars in the U.S.


Green cars in U.S.
Cars in U.S.
VW's in U.S.

F34.1 Minicomputer Introduction #5

CAPSULE LESSON SUMMARY

Review representation of numbers between 0 and 19 on the Minicomputer. Introduce the standard configurations for 20, 40, and 80 on the Minicomputer. Put numbers larger than 10 on the Minicomputer.

MATERIALS

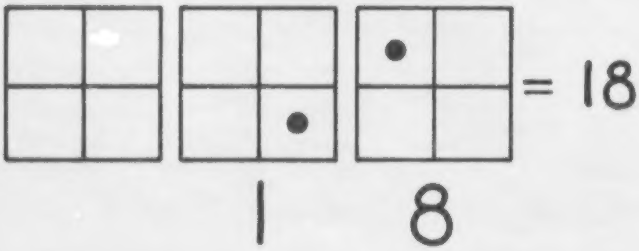
Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

Exercise 1

Display three Minicomputer boards. Tell the students that you are going to write some numbers on the Minicomputer and they should each whisper to you which number it is. Try to include all your students in this activity. Accept four or five whispers and then ask a student to answer aloud. If you wish, you might use some non-standard configurations to challenge your brighter students. Feel free to show any number up to 19 during this activity but try to vary the numbers enough to involve all of your students. When the number is more than 9 and is shown on two boards, you should ask a volunteer to write the appropriate numeral below the Minicomputer.

Occasionally when the number is more than 9, it would be good to also write the numeral to one side of the Minicomputer with "=" between the Minicomputer and the numeral.

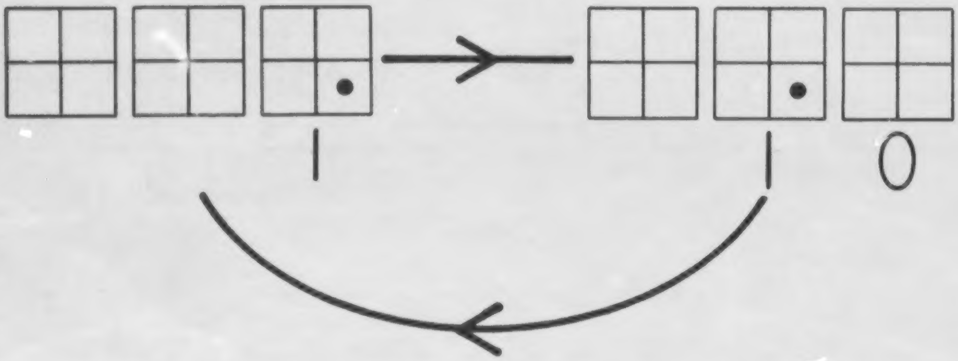


F 34

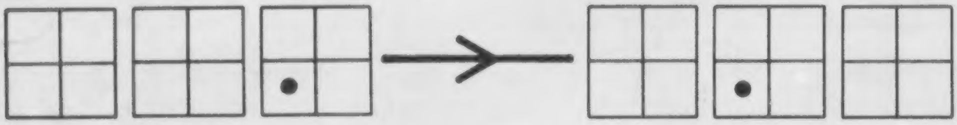
This is especially appropriate when the student has written very small or widely-separated numerals below the Minicomputer.

Exercise 2

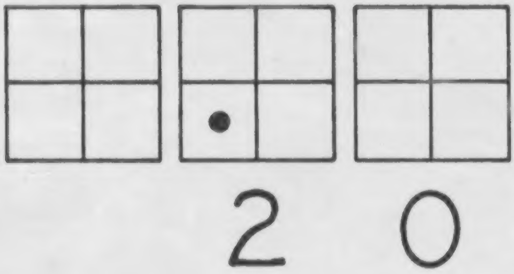
Move a checker quickly back and forth from the 1-square to the 10-square, and have the class say, "One-ten-one-ten" as you do so.



Put a checker on the 2-square and say, "Two". Now move the checker to the 20-square and say, "Twenty".



Write a "2" under the tens' board and "0" under the ones' board.

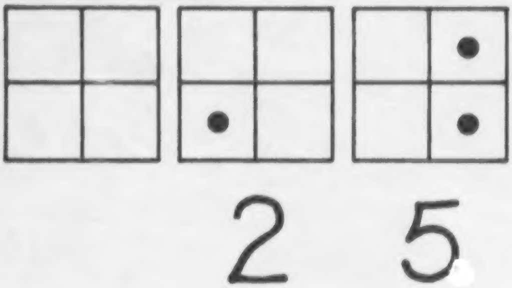


Move the checker briskly back and forth from the 2-square to the 20-square and have the class say, "Two-twenty-two-twenty" as you do so.

Repeat this activity with 4 and 40, and 8 and 80.

Exercise 3

T: Who can put 25 on the Minicomputer?
Who can write "25" below the Minicomputer?



If the digits are not written clearly below the Minicomputer, you should rewrite the "25" yourself with "2" below the tens' board and "5" below the ones' board.

If the class is interested and is enjoying the lesson, continue with Exercise 4.

Exercise 4

Ask the class if someone would like to put a number on the Minicomputer which is more than 10. Encourage the students to write the appropriate numeral under the Minicomputer and be prepared to help when necessary. If the student has shown a number on the Minicomputer incorrectly, say "No, this number is not ____; this number is ____." Explain why the number is ____, but do not insist that the student put the chosen number on the Minicomputer.

F 34

F34.2 +2 Snake

CAPSULE LESSON SUMMARY

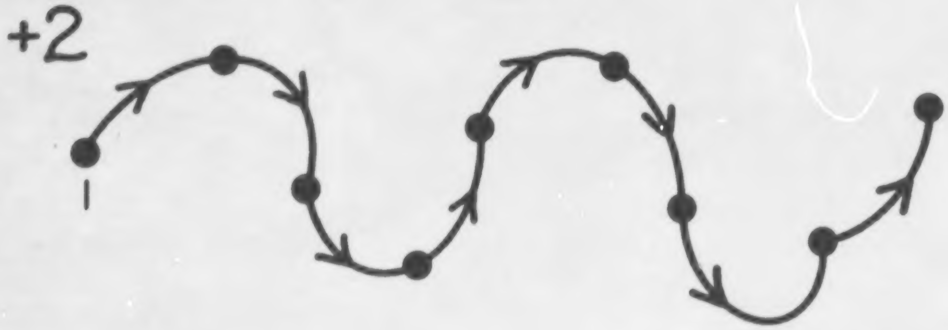
Use a snake with +2 arrows to associate adding two and counting by twos.

MATERIALS

Teacher: Colored chalk
Student: Worksheet F34.2* and **

DESCRIPTION OF LESSON

Draw this long snake on the board. Use red (or a color of your choice) for the arrows and white for the dots. Write "+2" in red (or the color you are using) near the snake and label the first dot "1".



T: The red arrow is for +2. When we follow a red arrow we must add two.

T (pointing to the dot labeled "1"): Hold up one finger.
Now hold up two more fingers.
How many fingers are you holding up all together?

S: Three.

T: Right. One plus two is three.

Ask a student to come to the board and label the second dot "3".

With your left index finger, point to the first dot and with your right index finger, trace the arrow from the first to the second dot saying:

T: One . . . plus two . . . is three. This dot is for 3.

Point to "3" on the number line.

T: Now, we wish to add two again.

Count up two more spaces on the number line.

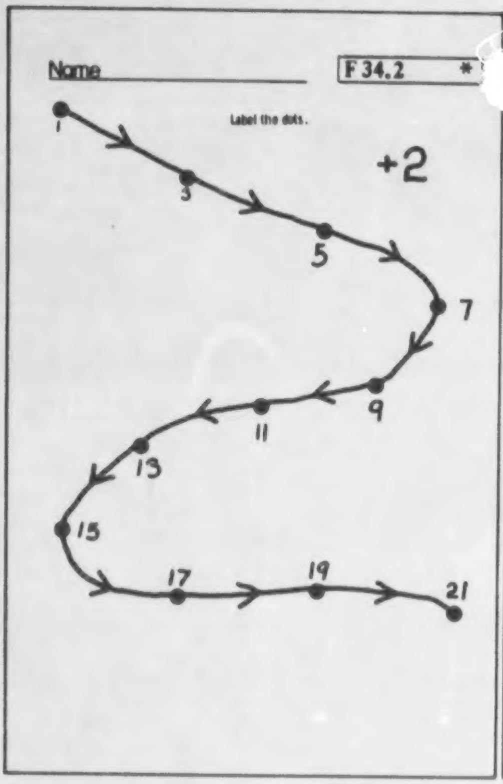
T: Three plus two is five.

Have a student label the third dot "5". Point to the second dot and trace the second arrow as you say:

T: Three . . . plus two . . . is five.

Continue to label the rest of the dots, using a combination of these methods. To emphasize that the "snake" could go on and on, you might ask---after the last dot is labeled---whether the class thinks you could continue adding two as long as you wish.

Erase the board and distribute Worksheets F34.2* and **. Students who finish labeling the dots on the * worksheet should go on to label the dots on the ** worksheet.



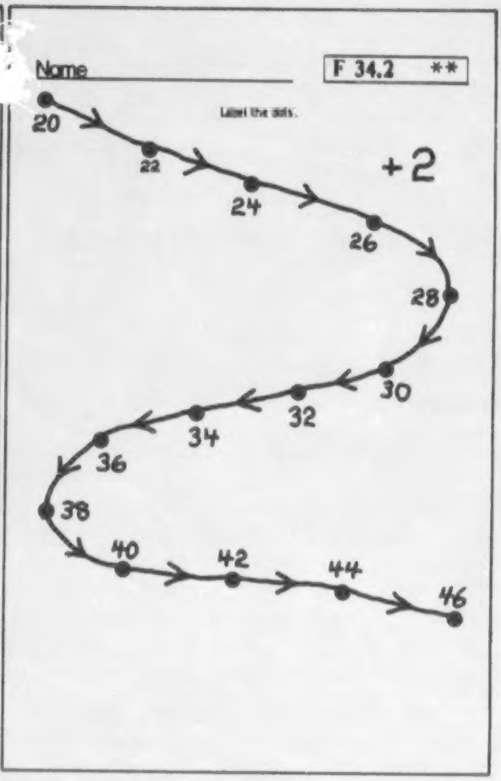
Name

F 34.2 *

Label the dots.

+2

1
3
5
7
9
11
13
15
17
19
21



Name

F 34.2 **

Label the dots.

+2

20
22
24
26
28
30
32
34
36
38
40
42
44
46

F35 The Numbers Speak #2

CAPSULE LESSON SUMMARY

Review the relations "more than" and "less than". Label the dots in an arrow picture where the arrows are for "is less than" and explore various extensions of this arrow picture.

MATERIALS

Teacher: Colored chalk

Student: Colored pencils and unlined paper

DESCRIPTION OF LESSON

Exercise 1

Tell your class that you are going to play a game and that they should not answer unless you point to them. Here is a sample dialogue for the game.

T:	3 is less than . . .	S:	5
	5 is less than . . .		9
	9 is less than . . .		10
	10 is less than . . .		11
	11 is less than . . .		12
	12 is less than . . .		19
	19 is less than . . .		50
	50 is less than . . .		100
	100 is less than . . .		200
	200 is less than . . .		1,000,000
	1,000,000 is less than . . .		1,000
	No, 1,000,000 is not less than 1,000.		
	1,000,000 is less than . . .		5,000,000

If your students begin to give consecutive numbers, you should give a skip count to encourage them not to restrict themselves. You may want to have a

F 35

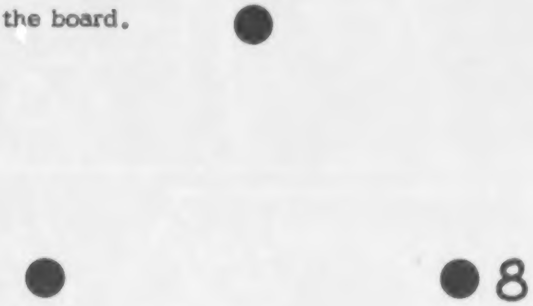
student write one of the larger numbers on the board or write it yourself if no student is able to. When you think you have played this game long enough, change it to an "is more than" game.

T:	Now listen carefully.		
	5,000,000 is more than . . .	S:	1,000,000
	1,000,000 is more than . . .		100
	100 is more than . . .		50
	50 is more than . . .		40
	40 is more than . . .		25
	25 is more than . . .		24
	24 is more than . . .		20
	20 is more than . . .		5
	5 is more than . . .		1
	1 is more than . . .		0

Continue this activity for five or ten minutes. If you prefer the words "smaller" and "larger" to "less" and "more" respectively, feel free to substitute them throughout the lesson.

Exercise 2

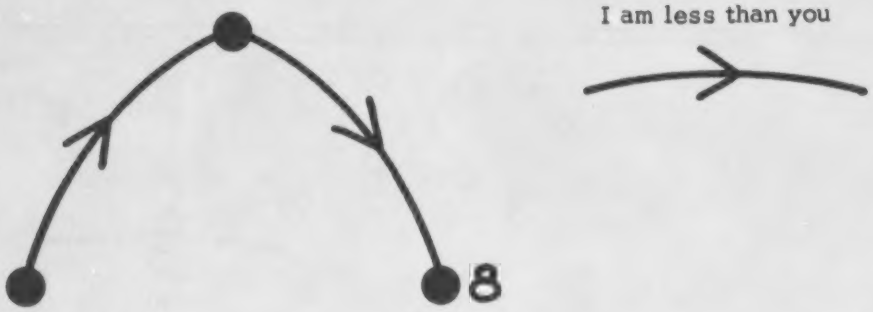
Draw three dots on the board.



T: These dots are for numbers.
One of the numbers is 8.
We don't know which numbers the other dots are for.

T: These numbers are playing a game. They are saying, "I am less than you."

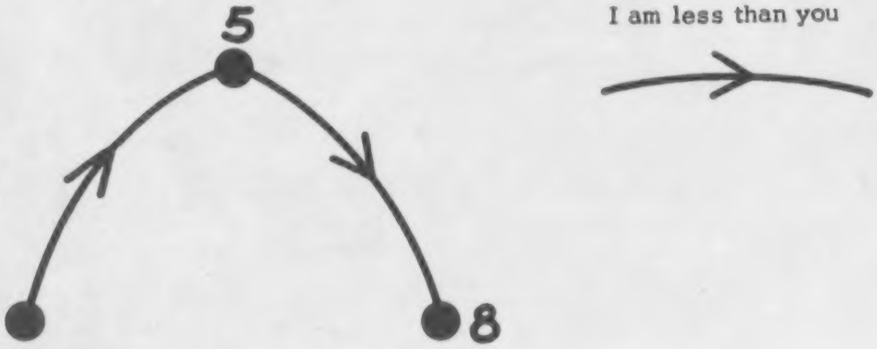
Add arrows to your drawing.



T: Which number is the smallest? (the dot on the left)
Which number is the largest? (8)
If this number is 8 (point to "8"), what could these other numbers be?

Have two volunteers come up and each label a dot. If the students label them incorrectly, ask the class to correct their mistakes.

Here are some labels which might be suggested.

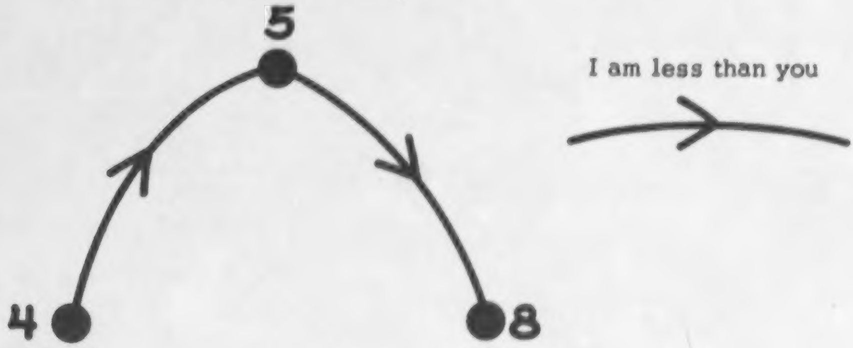


F35

T: Who can tell us what 5 is saying to 8?

S: "I am less than you."

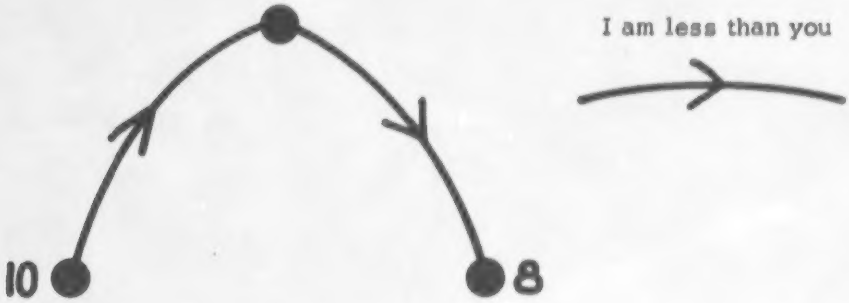
T: Is 5 less than 8? (Yes)
Then this number could be 5 (point to middle dot).
Who would like to label the other dot?



T: Who can tell us what this arrow picture shows us?

S: 4 is less than 5, and 5 is less than 8.

Assist the students with this explanation, if necessary. Erase the labels except for "8" and repeat this activity two or three times.

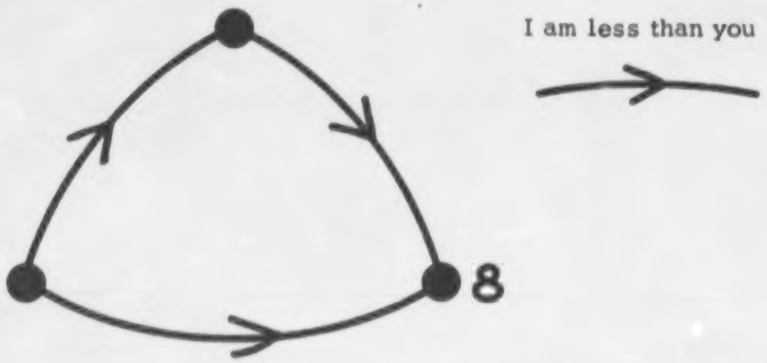


If no student suggests this type of situation, propose it yourself. Point to the dot on the left and label it "10".

T: Could this dot be for 10? (No)
How do you know?

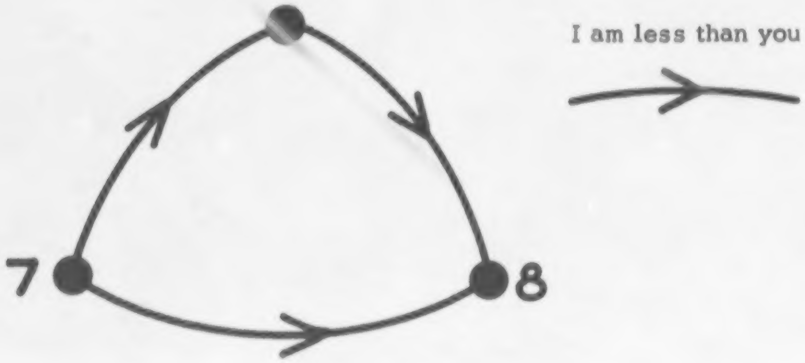
Do not expect the student to verbalize the explanation for this clearly. Accept any answer which implies the following: Since the first number is less than the second one, and the second one is less than 8 . . . the first number must also be less than 8. Erase the "10".

T: Could we draw another red arrow? (Yes)



Ask students to again suggest labels for the unlabeled dots in this arrow picture.

NOTE: It is possible for situations to develop which would require the use of numbers other than the whole numbers; for example,

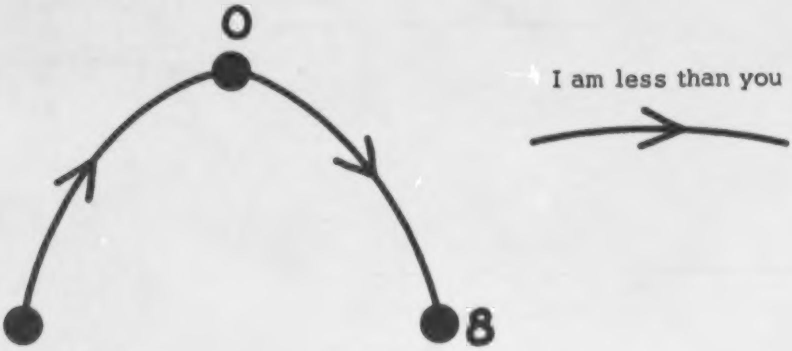


F 35

Most first graders will not be aware of any numbers which are both more than 7 and less than 8. The students will probably conclude that there is no number between 7 and 8. In this case, you should say, "You don't yet know any numbers which are between 7 and 8."

If a student suggests a number which is between 7 and 8, such as $7\frac{1}{2}$, accept this answer as correct but do not emphasize it. Simply erase the suggested labels and begin again.

Here is another such situation.

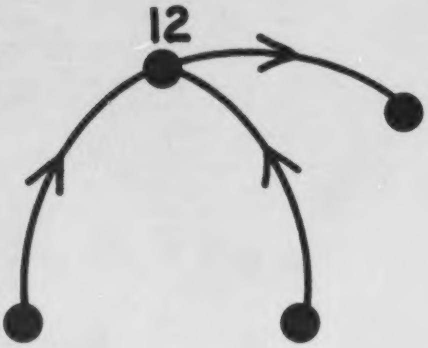


Most first graders will not be aware of any numbers which are less than 0 and will probably conclude that there are no such numbers. In this case, you should say, "You don't yet know any numbers which are less than 0."

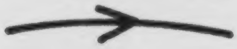
If a student suggests a number which is less than 0, such as some negative number, accept this answer as correct but do not emphasize it. Simply erase the suggested labels and begin again.

Exercise 3

Erase the previous arrow picture and draw this new one.



I am less than you



T: What are these arrows saying?

S: "I am less than you."

T: Who would like to read this arrow picture for us?

When a student volunteers, assist in tracing the arrow on the left and say,

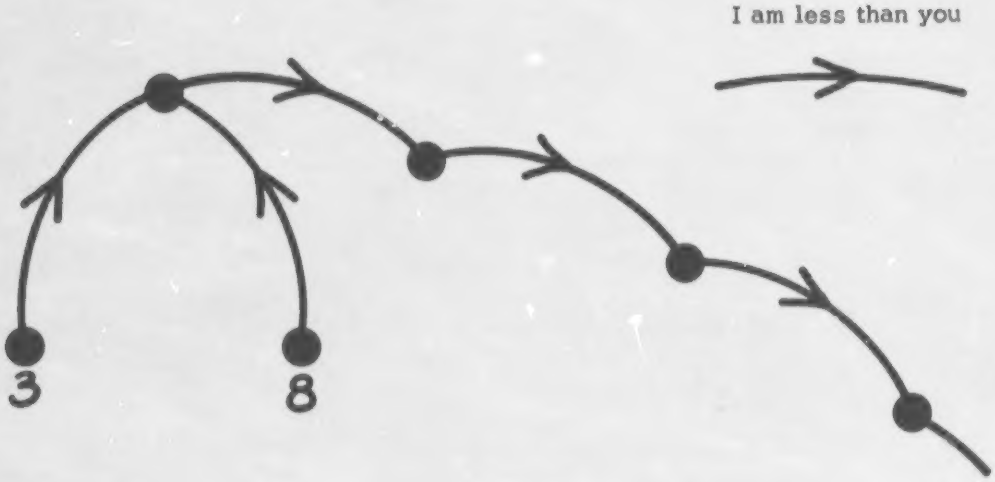
T: "This number is less than 12."

Have the student continue until all three arrows have been read.

Distribute unlined paper and colored pencils. Ask the students to copy the arrow picture which you have drawn on the board. They should label all the dots in their drawing. If a student is unable to copy the arrow picture, you should copy it for him or her. You may wish to reinforce successful slower students at the end of the lesson by having them complete the arrow picture on the board while you are collecting the papers.

F 35

When some of the students begin to finish the last activity, draw this arrow picture on another board.



When students finish the first arrow picture, ask them to copy this second arrow picture and label the dots. Encourage them to continue adding arrows as far as possible.

You may wish to encourage students who finish quickly to add to their arrow pictures some missing red arrows.

F36.1 Minicomputer Introduction #6

CAPSULE LESSON SUMMARY

Put on the Minicomputer and read numbers less than 100. Write number stories about various configurations for numbers on the Minicomputer.

MATERIALS

Teacher: Minicomputer set

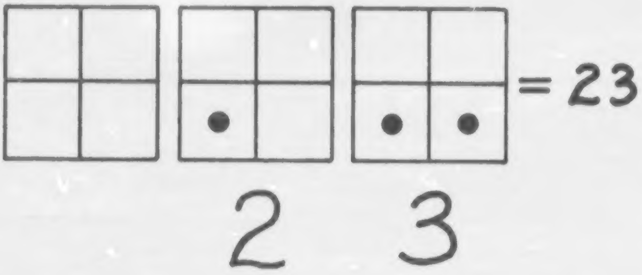
Student: None

DESCRIPTION OF LESSON

Exercise 1

Display three Minicomputer boards. Tell the students that you are going to put a number on the Minicomputer and they should tell you with whispers what number it is. You may wish to alternate easier numbers with difficult ones so that both the slower and brighter students may be involved during this activity. Feel free to use any number up to 99 and to represent some of the smaller numbers with a non-standard configuration. Each time accept four or five whispered answers and then ask a student to answer aloud. If the number has two digits you may wish to ask a student to write it below the Minicomputer.

Occasionally, when the number is more than 9, you should write it to one side of the Minicomputer with "=" between the Minicomputer and the numeral.



F 36

This is especially appropriate when the student has written very small or widely-seperated numerals below the Minicomputer.

Exercise 2

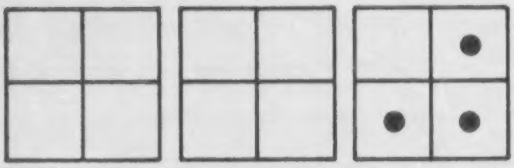
T: Who can put 7 on the Minicomputer?

Accept any correct answer.

T: How do we know this is 7?

As a student explains, write the appropriate number story on the board.

For example, if the standard configuration for 7 is given, there are several possible number stories.



4 + 2 + 1 = 7

5 + 2 = 7

4 + 3 = 7

6 + 1 = 7

It is sufficient to write a single number story, but if more are volunteered, record them also. You may wish to have the students demonstrate a number story with their fingers.

T: Who can put 9 on the Minicomputer?

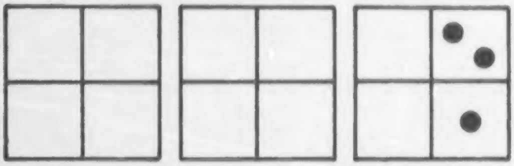
Accept any correct answer.

T: How do we know this is 9?

If necessary, help the student verbalize the explanation.

T: Who could write a number story on the board?

For example, if this non-standard configuration of 9 is offered, there are several possible number stories.



8 + 1 = 9

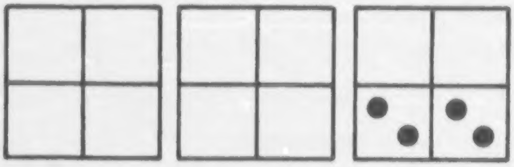
4 + 4 + 1 = 9

4 + 5 = 9

Again, it is sufficient to write just one number story, but if more are volunteered, record them also. You may wish to have the students demonstrate a number story with their fingers.

Exercise 3

Put this configuration on the Minicomputer.



T: What is this number? (6)
How do you know?

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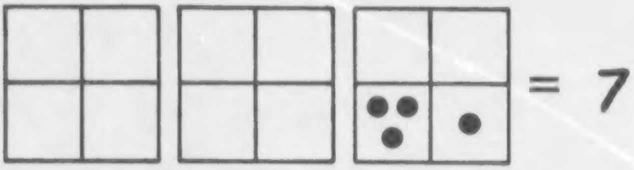
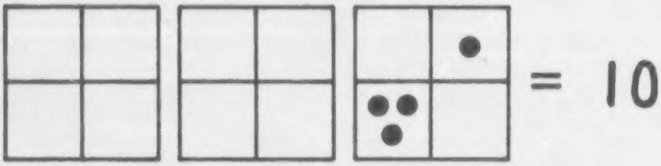
If necessary, help the students verbalize the explanation.

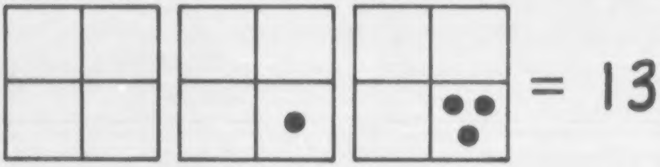
T: Who could write a number story on the board?

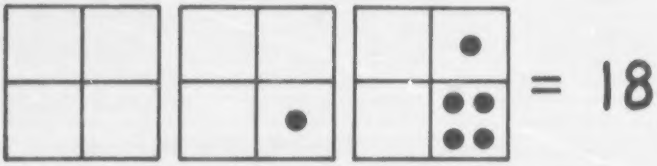
Who would like to show us another way to put 6 on the Minicomputer?

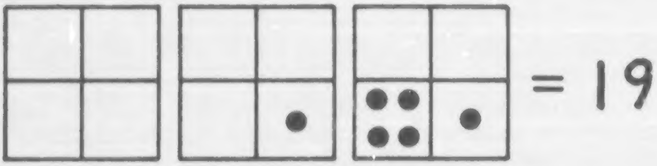
Follow a similar sequence for some of the following configurations. Stop when the students begin to lose interest in this exercise.











F36.2 Tangram Puzzles #1

CAPSULE LESSON SUMMARY

Use all seven Tangram pieces to make various shapes.

MATERIALS

Teacher: None

Student: Set of Tangram pieces; Tangram booklet

DESCRIPTION OF LESSON

Distribute sets of Tangram pieces and Tangram booklets.

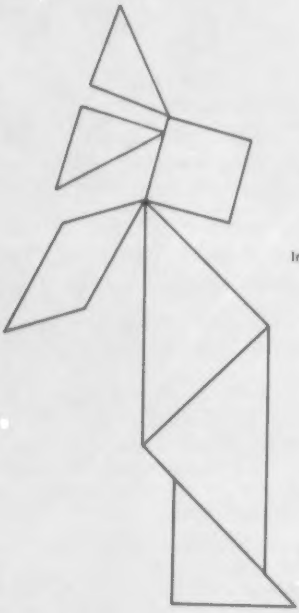
NOTE: Each Tangram set consists of two large triangles, two small triangles, a medium-sized triangle, a square, and a parallelogram. All seven pieces will fit in the large square pictured on the cover of the booklet. At the beginning and end of each Tangram lesson, you may wish to have the students "fill in" the square on the cover of their books to check for any missing pieces.

The instructions for each page of the booklet are the same: Use all seven Tangram pieces to cover the picture on that page. When students have completed a particular page, they should raise their hands; check the work on that page and have them try another.

The puzzles vary in difficulty; encourage students to be patient but persistent, and be prepared to give occasional help. Of course, if a student is unable to complete a particular puzzle, he or she may proceed to the next one.

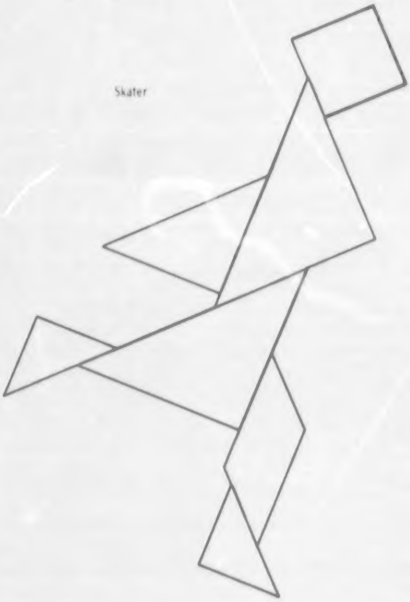
The Tangrams and Tangram booklets will be used again in Lesson F49.2, and on other occasions during the year.

Tangrams



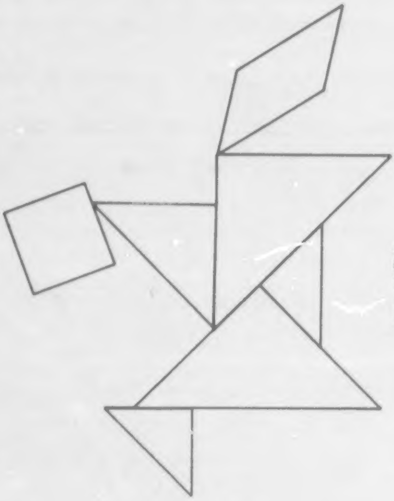
Indian Chief

3



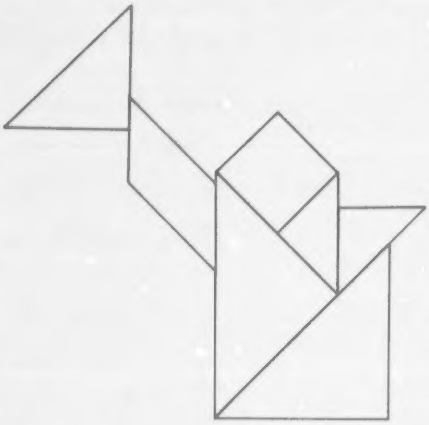
Skater

4



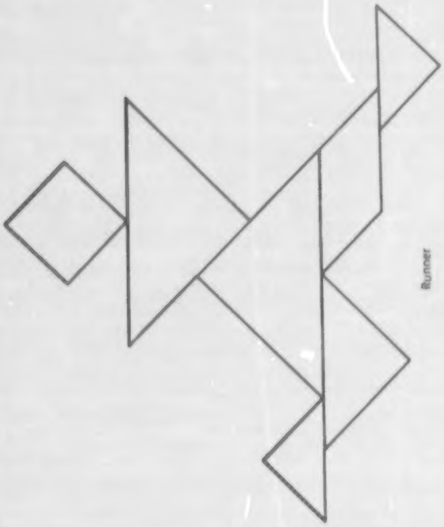
Horse and Rider

5



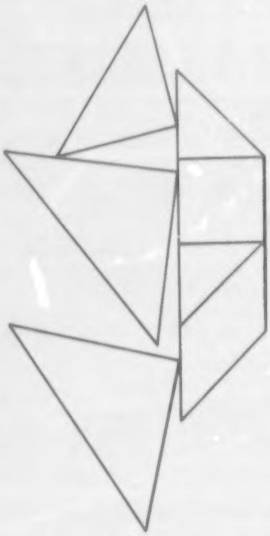
Watering Can

6



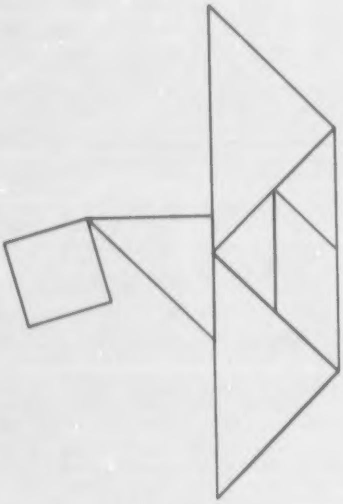
Runner

7



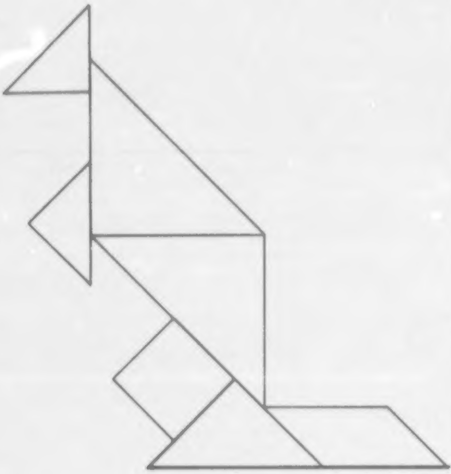
Boat

8



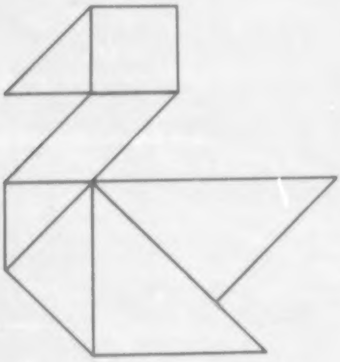
Another Boat

9



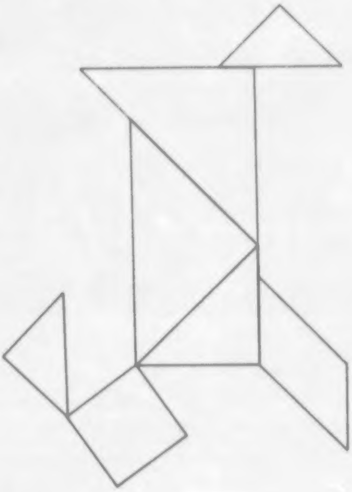
Kangaroo

10



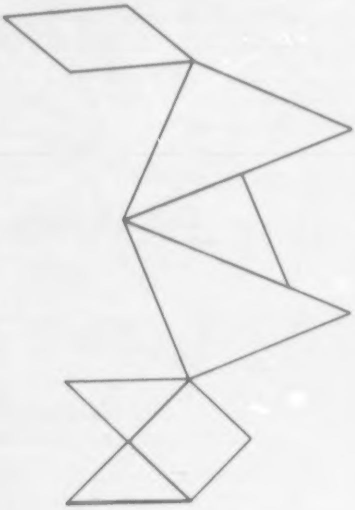
Duck

11



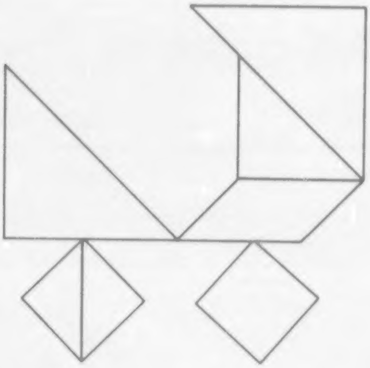
Dog

12



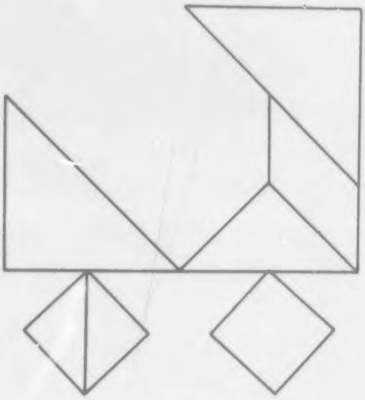
Cat

13



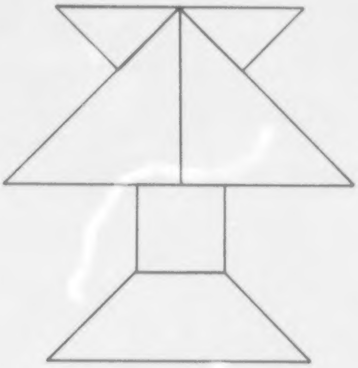
Carriage

14



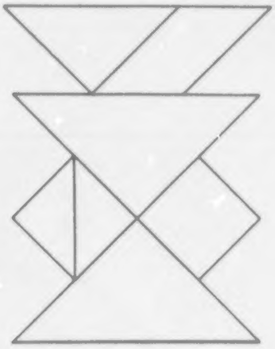
Another Carriage

15



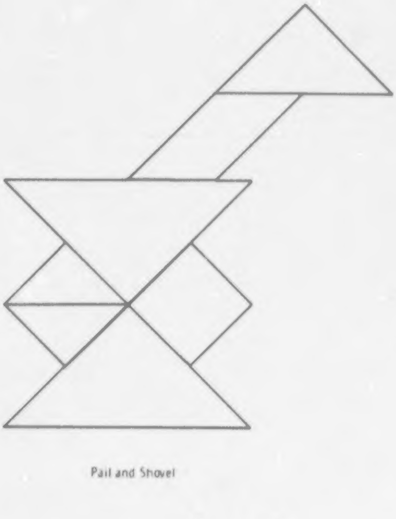
You name it! ______________

16



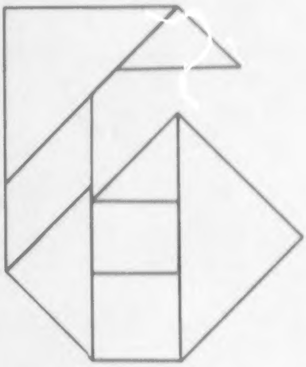
Vase

17



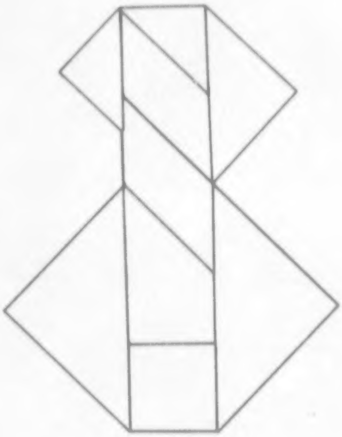
Pail and Shovel

18



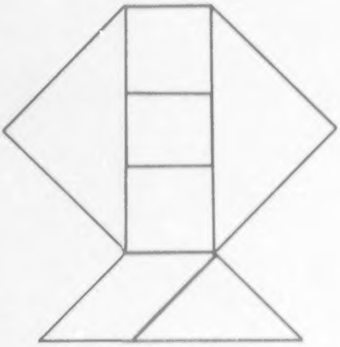
Six

19



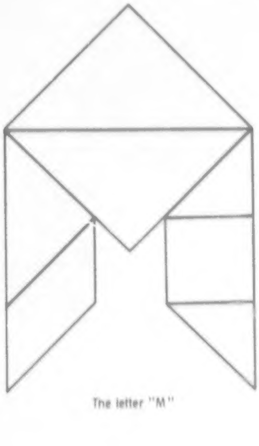
Eight

20



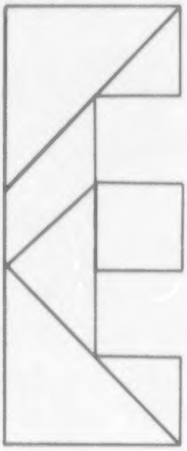
Knight's Helmet

21



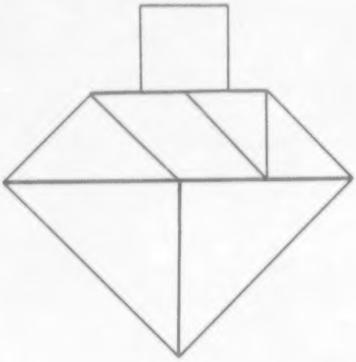
The letter "M"

22



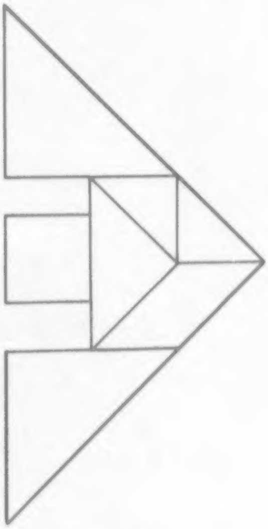
The letter "E"

23



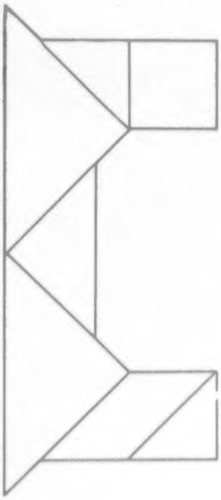
Top

24



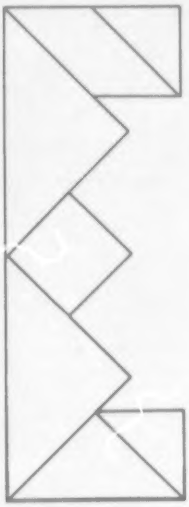
You name it! ______

25



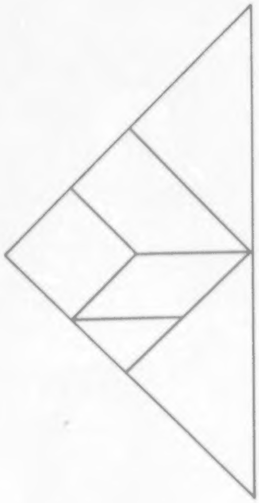
Table

26



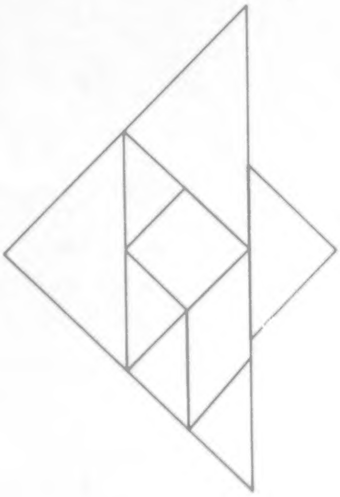
Bridge

27



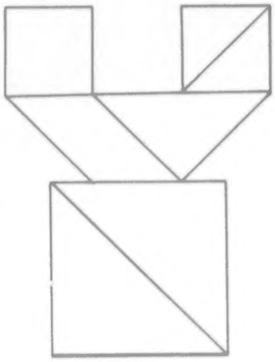
Triangle

28



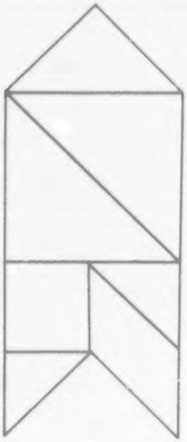
Mask

29



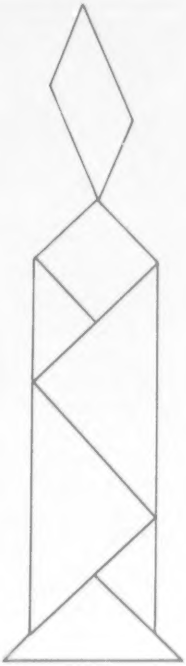
Trophy

30



Arrow

31



The End

32

F 37

F37 Sending Halloween Cards

CAPSULE LESSON SUMMARY

Discuss an arrow picture in which the dots are for children and the arrows are for "I sent a Halloween card to you".

MATERIALS

Teacher: Colored chalk

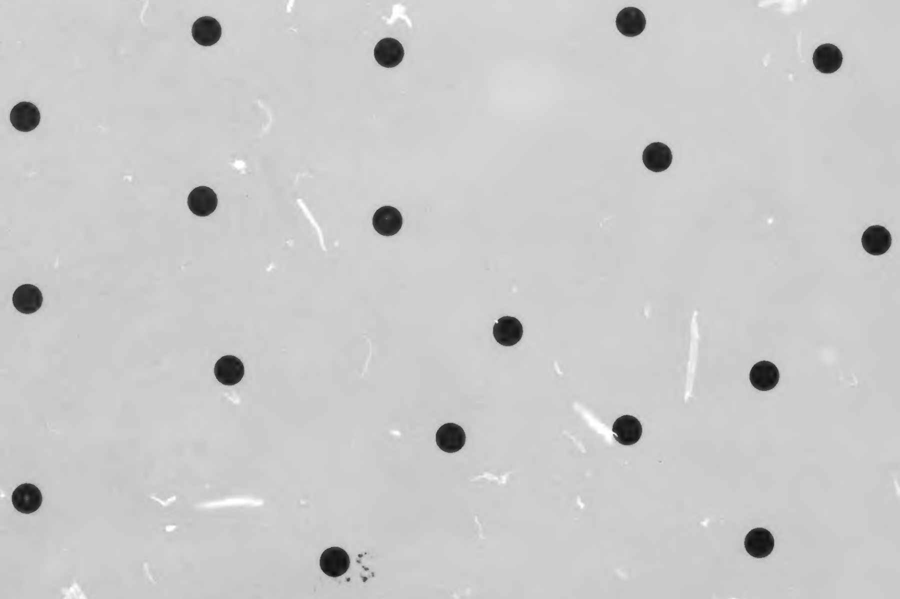
Student: Colored pens, pencils or crayons; paper

DESCRIPTION OF LESSON

NOTE: Your drawing of the dots shown below should be as accurate as possible, so that later the arrows can be properly drawn. You may want to draw the dots on the chalkboard or on an easel pad sheet of paper before the lesson begins.

T: In some schools, children exchange Halloween cards.
Here are some children.

Draw these 18 dots.

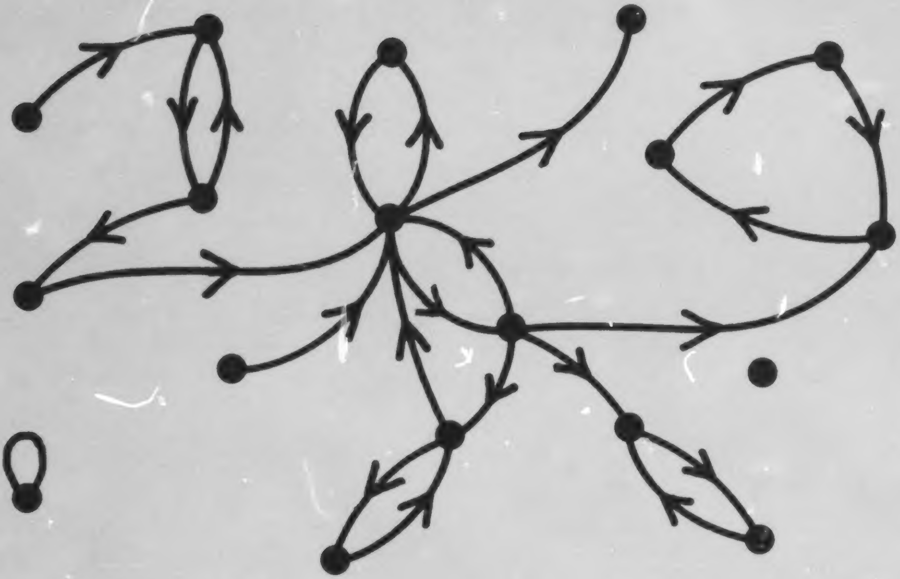


Have a few students count the dots but keep the pace brisk. If the students find this too difficult a task, assist by putting a mark next to each dot as it is counted. Erase the marks before continuing.

Draw one of the arrows from the picture below, while saying:

T: This child (point to the dot where the arrow starts) sent a Halloween card (draw the arrow) to this child (point to the dot where the arrow ends).

Ask the students to close their eyes while you complete the arrow picture.



F 37

T: Open your eyes. Look at the picture silently and think carefully about it.

After a minute or so, invite the students to discuss the drawing. Let them express their thoughts spontaneously, even if these are not directly related to the arrow picture.

S: It's a very complicated picture.

S: It's pretty.

S: There are many arrows.

S: It looks strange!

S: I see one child who received a lot of cards.

In the case of a remark like this last one, ask the student to point to the child and to explain; for instance, trace all the arrows which end at the dot.

Mention that each child who sends a Halloween card is at the *beginning* of an arrow, and each child who receives a Halloween card is at the *end* of an arrow.

S: I see one child who sent four cards.

Ask the student to point to the dot and to trace the four arrows starting at that dot.

As the spontaneous discussion begins to fade, extend it with these questions for as long as the class remains interested.

T: Which child sent the most cards? How many?
Find a child who sent only one card.
Which child received the most cards? How many?
Find a child who received no cards.
Find a child who sent exactly one card and received exactly one card.
What do you think about the child whose dot has a loop?
Find all the pairs of children who sent cards to each other?
How many cards were sent altogether? (23)
How many cards were received altogether? (23)
Which child would you like to be? Why?

Distribute unlined paper and ask your students to draw exactly eight dots; one for themselves (label it "me") and seven more dots for seven other children. The students should draw a story of their own, using arrows of one color for "I sent a Halloween card to you".

Many different pictures are possible. Have some students show their finished drawings to the class and explain them briefly.

F 38

F38.1 0-109 Numeral Chart #2

CAPSULE LESSON SUMMARY

Use the 0-109 Numeral Chart to practice reading numerals, to do some counting exercises, and to explore some number patterns.

MATERIALS

Teacher: 0-109 Numeral Chart

Student: None

DESCRIPTION OF LESSON

From Lesson F27.1 (p. 222), choose several exercises which you either have not done, or would like to repeat.

F38.2 +1 Spiral #2

CAPSULE LESSON SUMMARY

Use a spiral arrow picture and arrows for +1 to associate counting by ones and adding one.

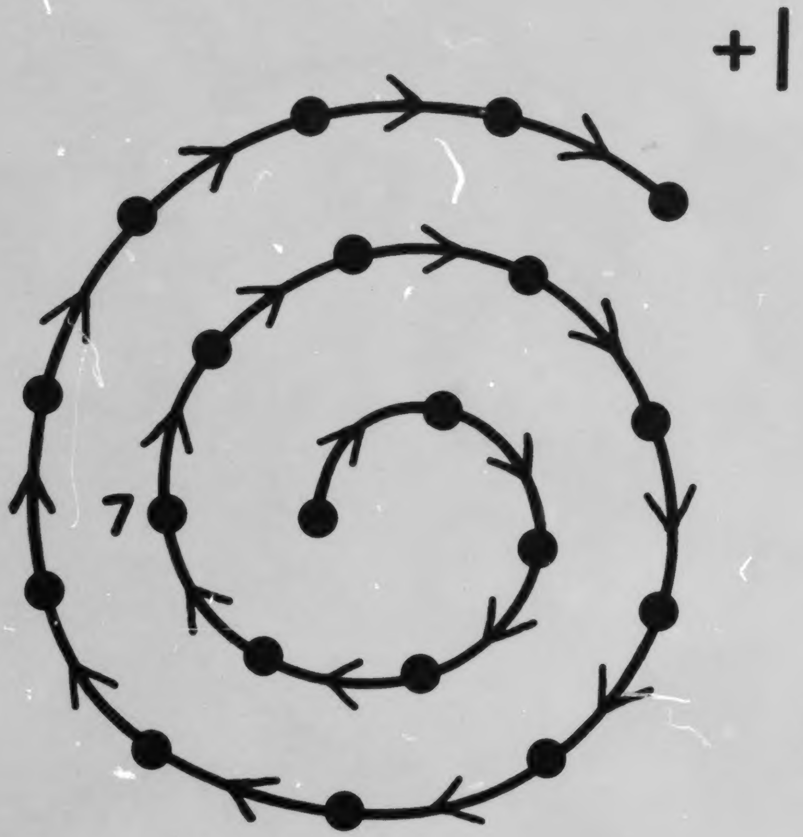
MATERIALS

Teacher: Colored chalk

Student: Worksheets F38.2* and **

DESCRIPTION OF LESSON

On the board, draw a large spiral.



F 38

T: The dots are for numbers and the red arrows are for +1.
Here is the number 7 (point to the dot labeled "7").

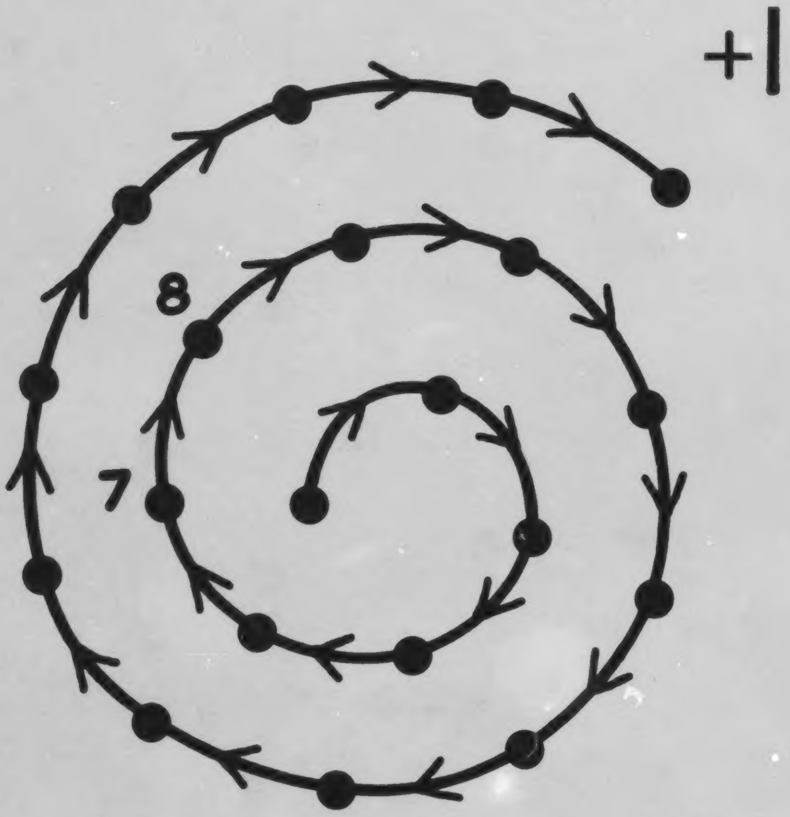
Trace the arrow from 7 to the next dot.

T: Which number is this?

S: 8.

T: Right. Seven plus one (trace the arrow) is eight.

Label the next dot "8".



T: Eight plus one is . . . ?

S: 9.

Label the next dot "9".

T: Nine plus one is . . . ?

S: 10.

Label the next dot "10".

Continue "forward" several more steps. Then point to the dot that precedes 7 on the spiral.

T: What is this number?

S: 6.

T: Right. Six plus one (trace the arrow) is seven.

If the student suggests an answer other than 6, such as 5, say:

T: Does five plus one (trace the arrow) equal seven?

S: No.

T: Then this dot cannot be 5.

Another likely answer is 8. If this answer is suggested, say:

T: Does eight plus one (trace the arrow) equal seven?

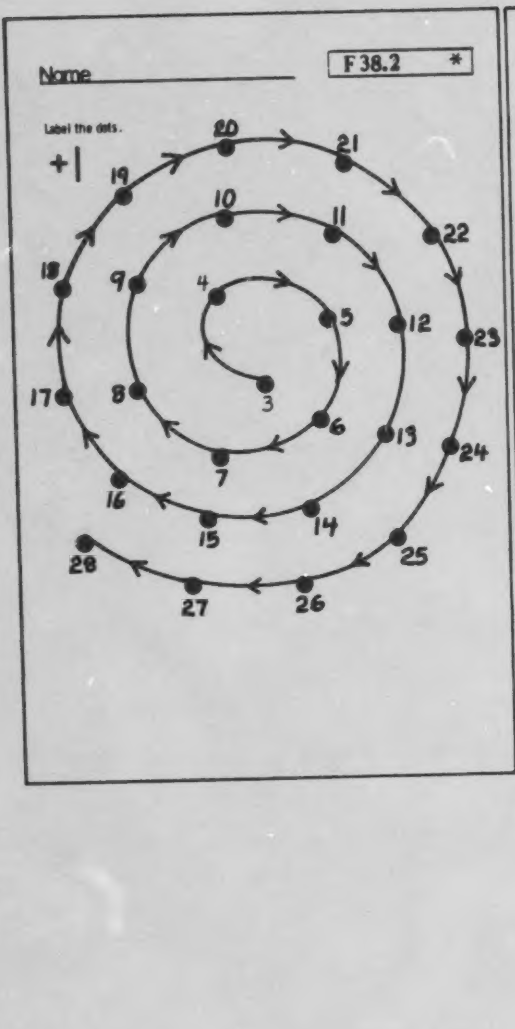
F 38

S: No.

T: Then this dot cannot be 8.

Continue "backward" labeling the dots for 5, 4, 3 and 2.

Distribute Worksheets F38.2* and **. Students who successfully label all the dots on the * worksheet should attempt the spiral on the ** worksheet.

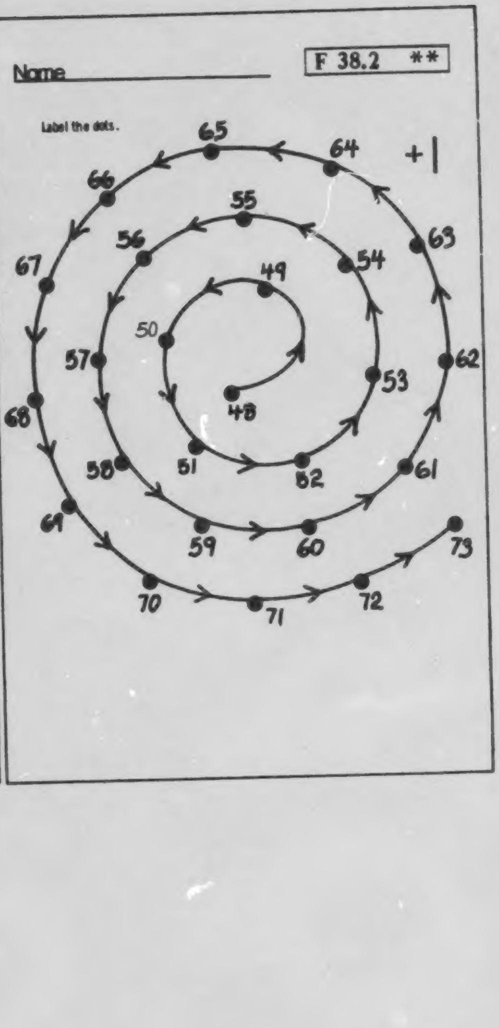


Name

F 38.2 *

Label the dots.

+1
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28



Name

F 38.2 **

Label the dots.

+1
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73

F 39

F39 Plays on the Minicomputer #1

CAPSULE LESSON SUMMARY

Put numbers from 0 to 20 on the Minicomputer. Review Minicomputer plays and introduce the remaining Minicomputer plays. Emphasize for the entire class the movements involved in making plays.

MATERIALS

Teacher: Minicomputer set; Demonstration Numeral Cards

Student: None

DESCRIPTION OF LESSON

For this lesson, either have the numeral cards at hand or have a pointer available so you can point to the numeral cards.

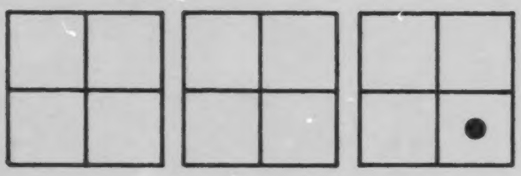
Exercise 1

Tell the students that you are going to hold up (or point to) a numeral card and that you will choose a volunteer to put that number on the Minicomputer. If someone puts the wrong number on the Minicomputer, the students should hold up both of their hands in silent protest. Ask one of the students who protested to put the correct number on the Minicomputer. Try to include all your students in this activity.

Always remove all checkers from the Minicomputer before proceeding to another number. If the number has two digits, you may wish to ask a student to write it below the Minicomputer. Have all the numbers 0 to 20 put on the Minicomputer once in any random order.

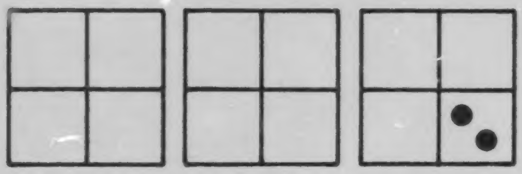
Exercise 2

Put one checker on the Minicomputer.



T: What is this number? (1)

Add another checker.



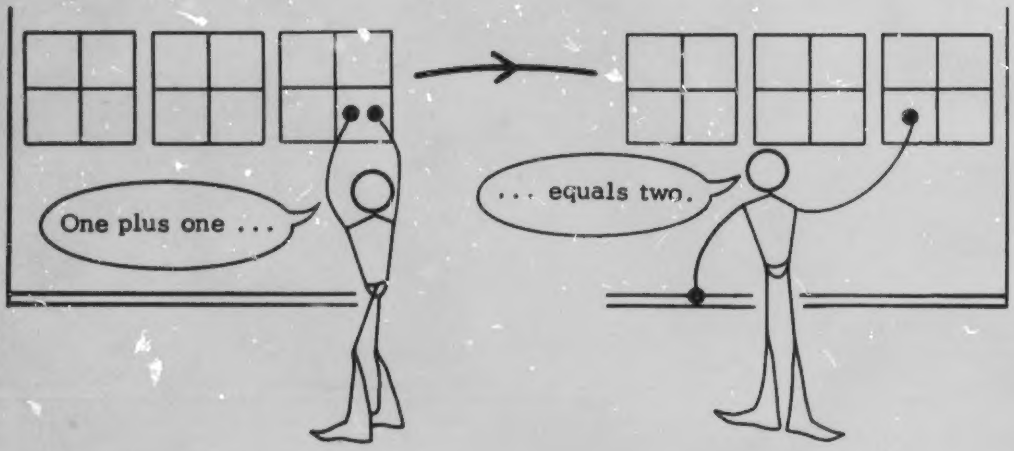
T: What number is on the Minicomputer now? (2)
How do you know?

The desired response is "1 + 1 = 2". If necessary, hold up one finger on each hand and say, "One plus one is two." Return to the Minicomputer and repeat, "One plus one equals two," lifting each checker briefly as you speak.

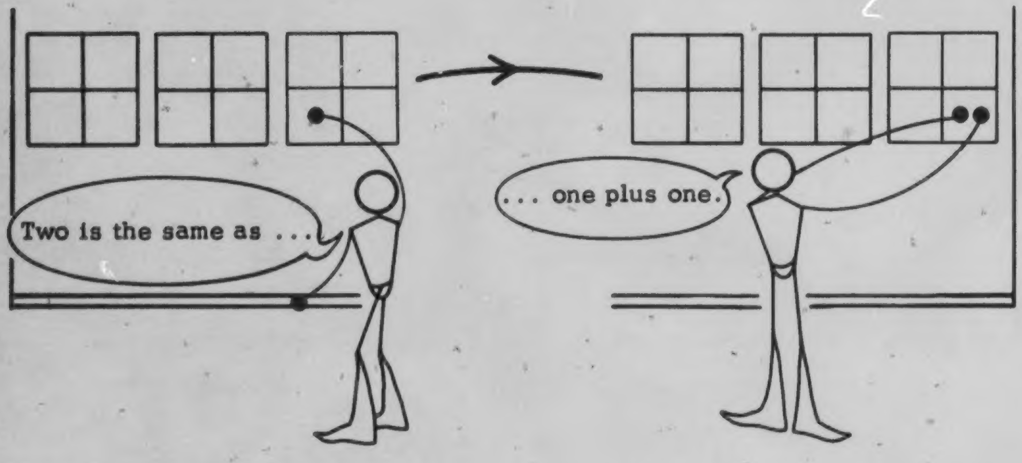
T: Can anyone show us another way to put 2 on the Minicomputer?

Be prepared to make the "play" yourself, if no student volunteers. In any case, you should demonstrate the play very dramatically and obviously after the play is first shown. Use both hands to make the play as illustrated on the following page. First, pick up the two checkers from the white square and say, "One plus one is two." Then put one of the checkers on the red square and put the other checker away.

F 39


One plus one ...
... equals two.

Pause briefly, and then pick up the checker from the red square saying, "Two is the same as one plus one." As you are speaking, pick up another checker and put both checkers on the white square.


Two is the same as ...
... one plus one.

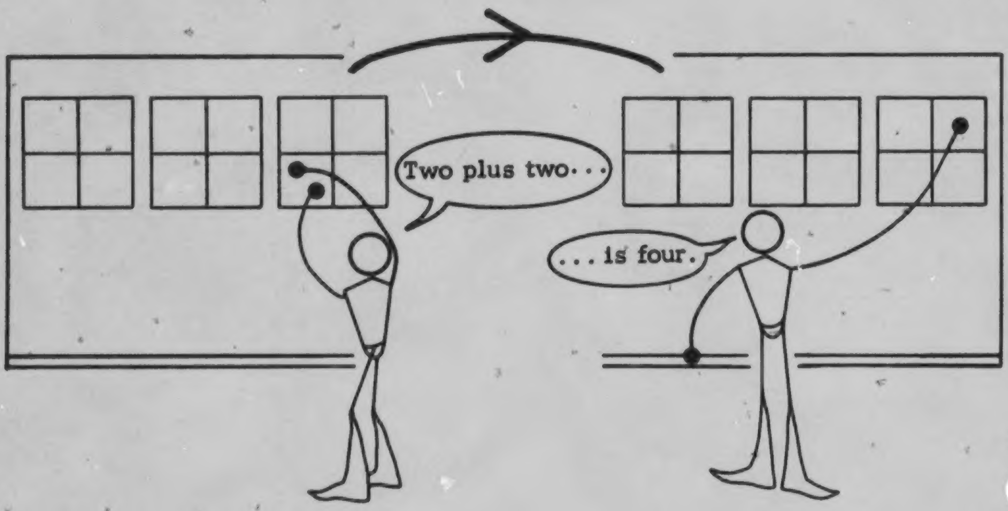
Demonstrate the "1 + 1 = 2" and "2 = 1 + 1" plays again.

T: What number is on the Minicomputer? (2)

Put another checker on the red square.

T: What number is on the Minicomputer now? (4)
Who can show us a way to put 4 on the Minicomputer with only one checker?

As a student makes the play, say, "Two plus two equals four." If the student does not use both hands, you should suggest this and help the student to make the two hands movements. After the play is made, you should repeat it in a very dramatic way, making what you are doing as obvious as possible to the students.

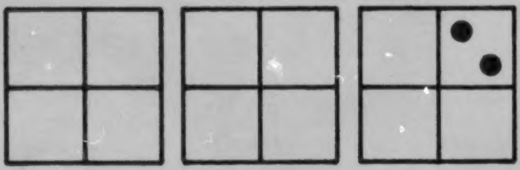


Pause briefly, and then make the "4 = 2 + 2" play. Stress the use of both hands as you make the "2 + 2 = 4" play again. Be sure the students realize that the play results in a checker being "left over" (which should be put on the chalk tray or back in the box).

F 39

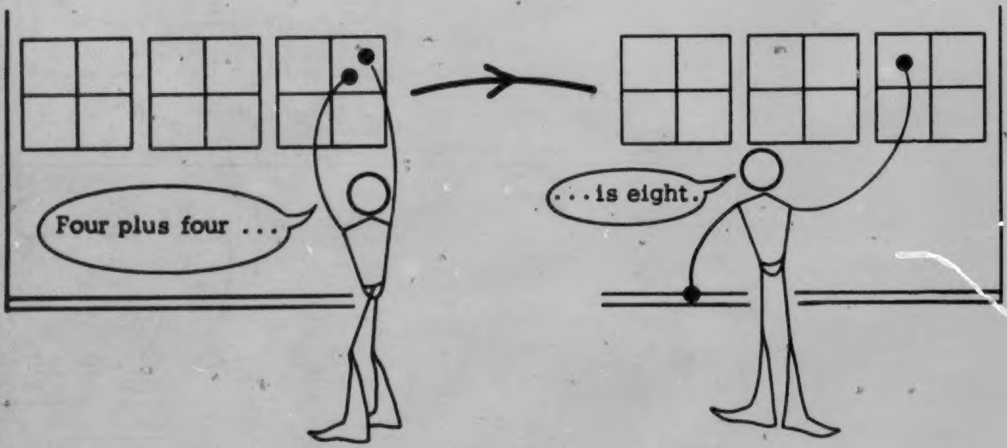
T: What number is this? (4)

Put another checker on the purple square of the ones' board.



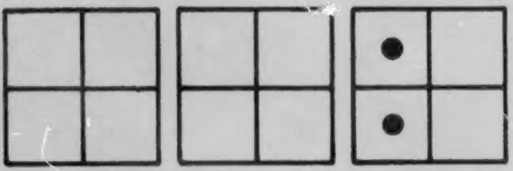
T: What number is on the Minicomputer now? (8)
Who can show us a way to show 8 with only one checker?

As a student makes the play, say, "Four plus four is eight." Encourage using two hands to make the play. You should then make the "8 = 4 + 4" and "4 + 4 = 8" plays in a very dramatic way.


Four plus four ...
. . . is eight.

T: What number is on the Minicomputer? (8)

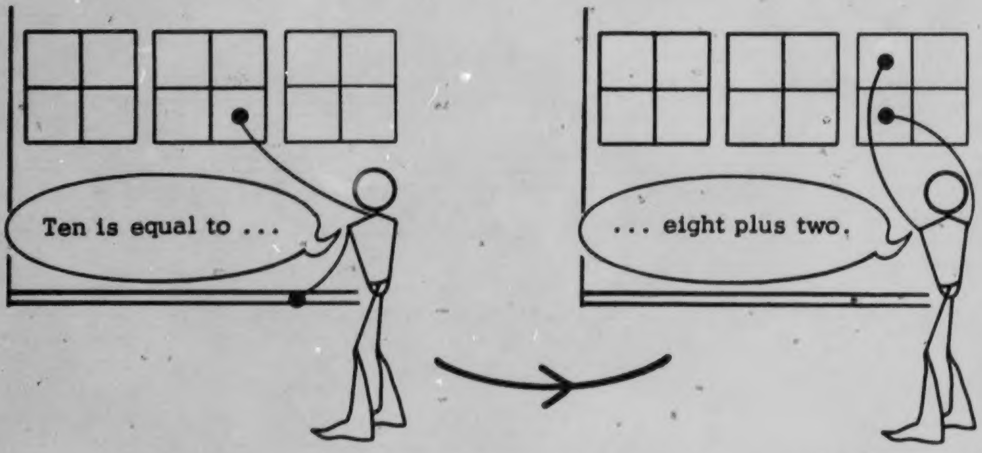
Add a checker to the red square of the Minicomputer.



T: What number is on the Minicomputer now? (10)

Who can show us a way to show 10 with only one checker?

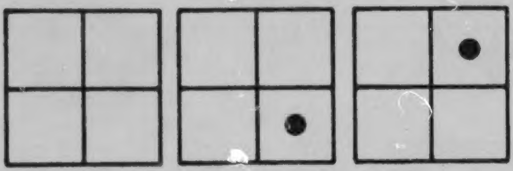
As a student makes the play say, "Eight plus two is ten." Again encourage the student to use two hands. After the play has been made, you should make the "10 = 8 + 2" and "8 + 2 = 10" plays again as dramatically and obviously as possible.


Ten is equal to ...
... eight plus two.

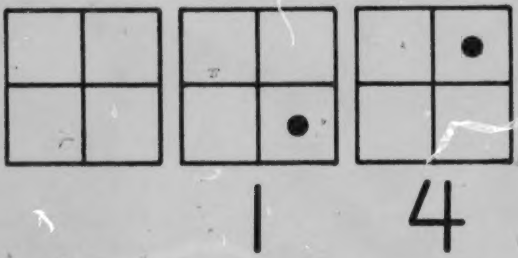
Repeat this several times. Use two hands, going back and forth between the ones' board and the tens' board. If the class is interested and is enjoying the lesson, continue with Exercise 3.

Exercise 3

T: Who can put 14 on the Minicomputer?



T: Who would like to write "14" below the Minicomputer?



Ask the class if they would like to put another number on the Minicomputer which is more than ten. Encourage the students to write the appropriate numeral under the Minicomputer. Be prepared to assist, if necessary. If a student has shown a number incorrectly on the Minicomputer, say, "No, this number is not ____; this number is ____." Explain why the number is ____, but do not insist that the student put the chosen number on the Minicomputer instead.

F40 Adjustment Day #4

NOTE: See the General Introduction, p. 16 for a full explanation of the purpose of scheduled adjustment days.

Today you may wish to repeat a previous lesson, either for a group of students, or for the entire class. Many of the lessons can be made to appear completely different by changing the story or the numbers. Lessons which you may wish to repeat include the following.

F27.1	0-109 Numeral Chart #1
F28.2	Hidden Dots #2
F31	Walks on One-Way Roads #2
F34.2	+2 Snake
F35	The Numbers Speak #2 (Exercise 1)

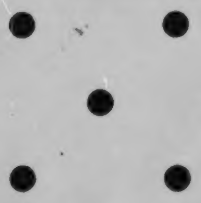
If you omitted any of the exercises in Minicomputer Introduction #4, #5, or #6, you may wish to pursue these exercises today.

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with F41 Addition Story #3.

The following game activities may be appropriate for students whose numerical readiness is weak.

How Many?

Draw these dots on the board.

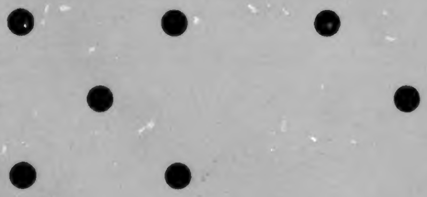


F 40

T: These are children playing in a park. How many are there?

S: Five.

Draw two more dots.

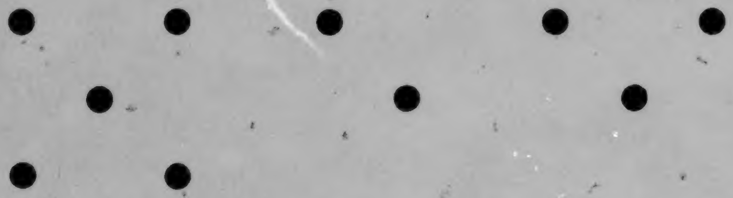


T: Now how many?

Encourage the students to answer without starting to count from one again. If they cannot answer immediately, you might help by showing the first five dots, and then pointing to the other two and counting "six," "seven."

T: Here come some more children.

Add three more dots.



S: Three more.

T: Right; how many all together?

S: Ten.

Follow the same counting technique as before. Afterwards, if you feel your group is unsure about the method you have used, you could ask a student to count by ones, as a check.

T: It is getting dark and, one by one, the children are going home. Remember there are ten of them. One goes home (erase one dot). How many are left?

Continue to erase one dot at a time, each time asking how many students are left.

Afterwards, ask a child to point to "10" in the numeral chart, and to count backward by ones.

F 41

F41.1 Addition Story #3

CAPSULE LESSON SUMMARY

Tell a story with string pictures about three boys putting pennies in their piggy banks. Use the story and the string pictures to pose and solve some addition problems.

MATERIALS

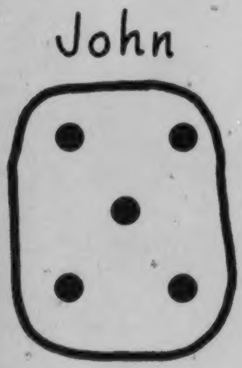
Teacher: Colored chalk

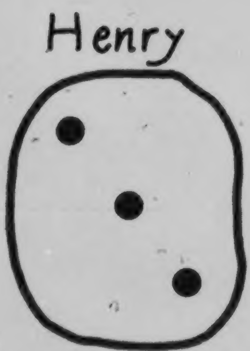
Student: None

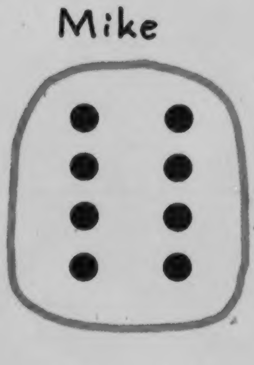
DESCRIPTION OF LESSON

T: This is a story about three brothers: John, Henry, and Mike. Each of them has a piggy bank which they are trying to fill with pennies. Here is how many pennies each has in his piggy bank.

Draw these three pictures on the board.







T: Who has the most pennies? (Mike)

Who has the fewest pennies? (Henry)

How many pennies does Mike have? (Eight)

If we put John's pennies and Henry's pennies together, how many would there be? (Eight)

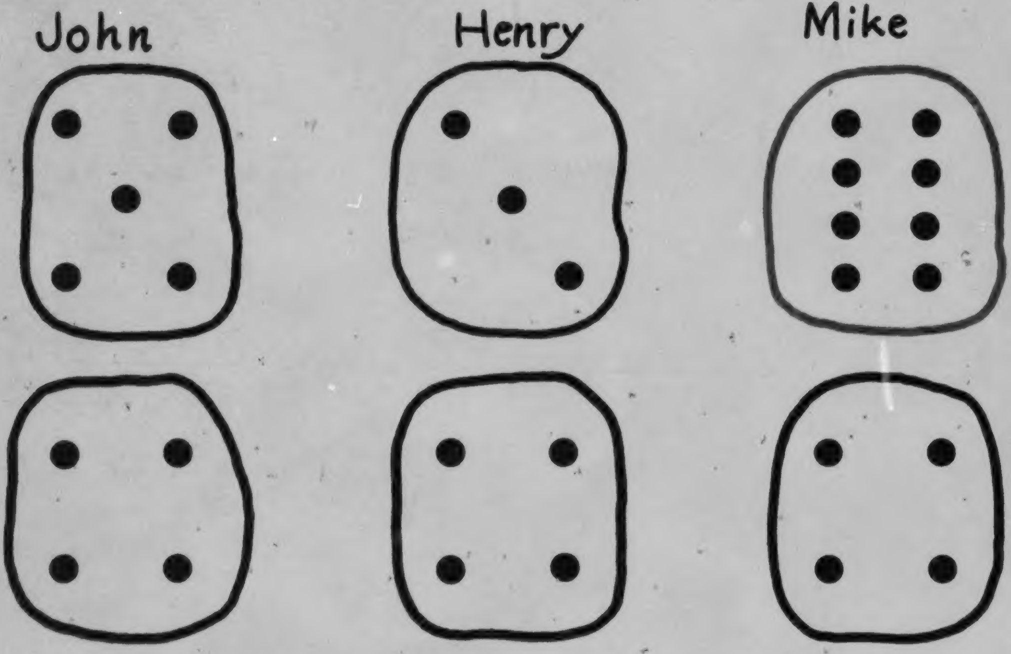
If necessary, ask a student to count these pennies.

T: Who has more pennies, Mike . . . or John and Henry (together)?

S: They have the same number of pennies.

T: Now, here is the rest of the story.
Yesterday the three boys were very helpful at home. This made their mother very happy and she gave them each four more pennies. Immediately, the brothers put the coins into their piggy banks. Now who has the most pennies? (Mike) Who has the fewest pennies? (Henry)

Add these pictures to your drawing.



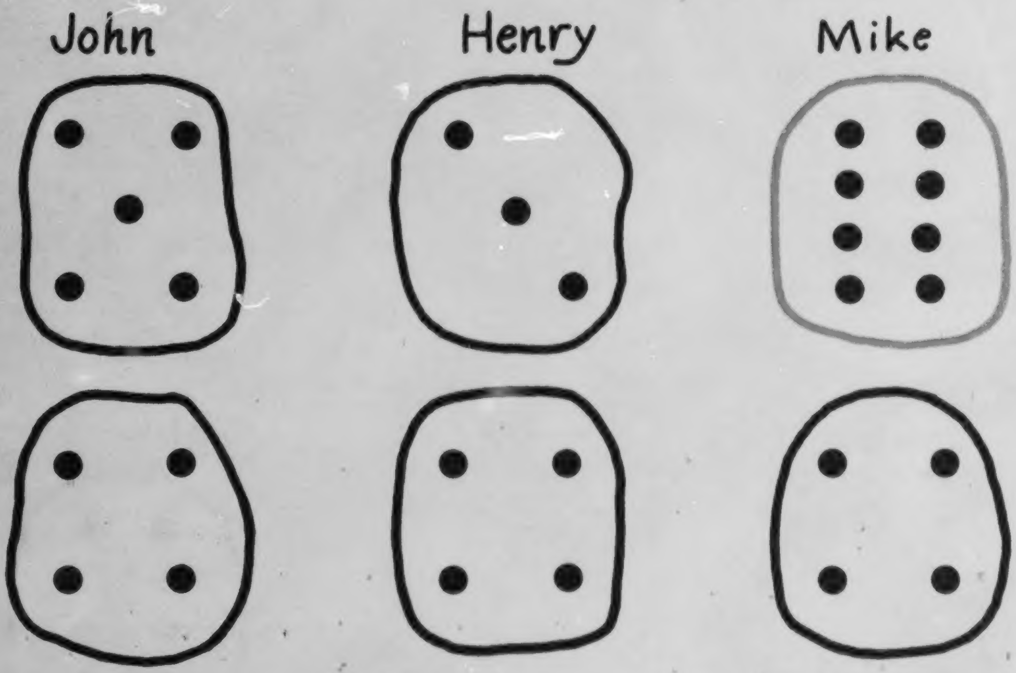
T: How many pennies does John have now? (Nine)
How many does Henry have? (Seven)
How many does Mike have? (Twelve)

If there is disagreement over an answer, ask a student to count the pennies.

F 41

T: What number stories could we write by the pictures?

It may be necessary for you to suggest the first number story yourself. As the students respond, write the number stories on the board.



5 + 4 = 9 3 + 4 = 7 8 + 4 = 12

F41.2 Minicomputer Worksheets #1

CAPSULE LESSON SUMMARY

Practice reading and putting numbers on the Minicomputer. Review the colors of the squares on the Minicomputer boards.

MATERIALS

Teacher: None

Student: Colored pencils or crayons; Worksheets F41.2*, **, and ***

DESCRIPTION OF LESSON

Distribute Worksheet F41.2* and display the first page to the class.

T: These are Minicomputer boards, but they are not colored. Color them so that they look like our Minicomputer.

When most of the students have finished coloring the first page, turn the worksheet over and display the second page.

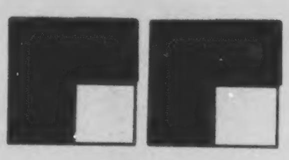
T: These Minicomputer boards are not colored, but you may pretend that they are. Each Minicomputer has a number on it. Write this number under the picture.

As students complete the * worksheet, distribute Worksheet F41.2**. Explain to the students that on the front page they are to put numbers on the Minicomputer by drawing checkers, and on the back page they are to write on the blank what number is on the Minicomputer.

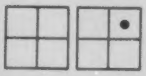
Students who finish the ** worksheet should be given Worksheet F41.2***.

Name ____________________ **F 41.2 ***

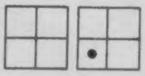
Color this Minicomputer.



What number is on the Minicomputer?



4



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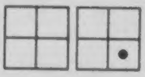

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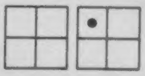

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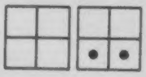

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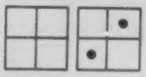

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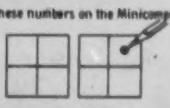
Name ____________________ **F 41.2 ****

Put these numbers on the Minicomputer. The first one is done for you.



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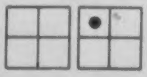

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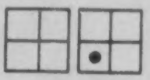

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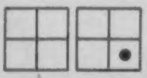

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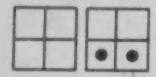

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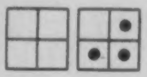

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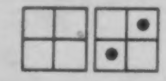

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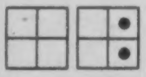

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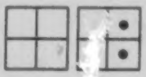
What number is on the Minicomputer?



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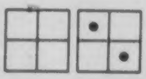

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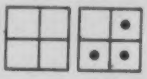

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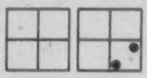

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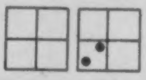

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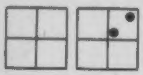

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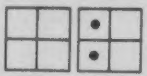
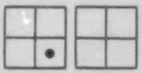
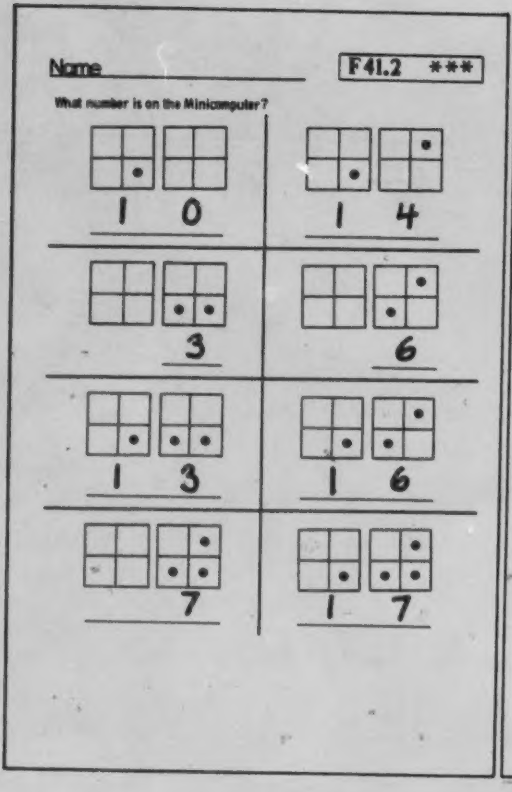


1 0



1 0



Name ____________ F41.2 ***

What number is on the Minicomputer?

1 0

1 4

3

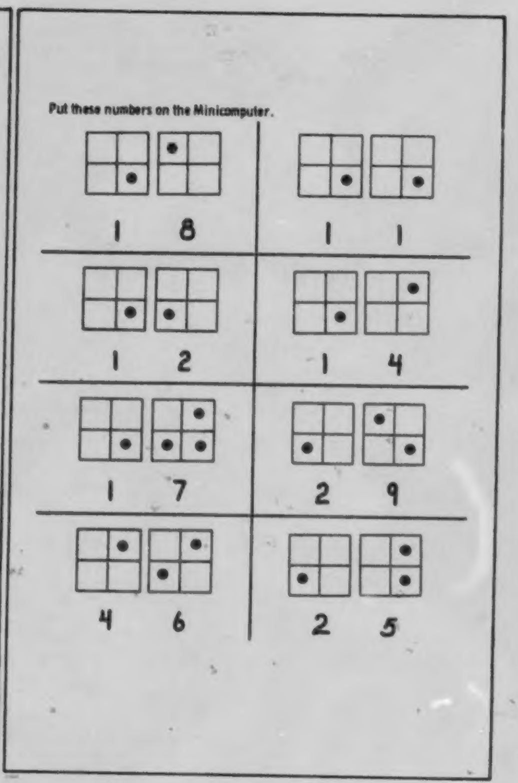
6

1 3

1 6

7

1 7



Put these numbers on the Minicomputer.

1 8

1 1

1 2

1 4

1 7

2 9

4 6

2 5

F 42

F42.1 Plays on the Minicomputer #2

CAPSULE LESSON SUMMARY

Progressively review the usual Minicomputer plays. Make plays so that numbers on the Minicomputer are easier to read. Read numbers on the Minicomputer and write the numerals below (above) the boards to relate place value with the boards.

MATERIALS

Teacher: Minicomputer set
Student: None

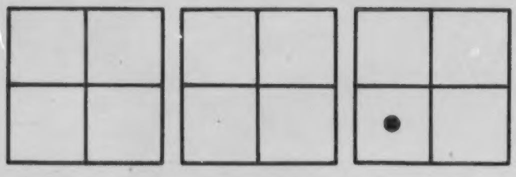
DESCRIPTION OF LESSON

Exercise 1

Display three Minicomputer boards.

T: Who would like to put 2 on the Minicomputer?

If a student puts two checkers on the 1-square, ask someone to make a play and show 2 another way. Encourage the students to use both hands and say the appropriate number story aloud as they make a play.

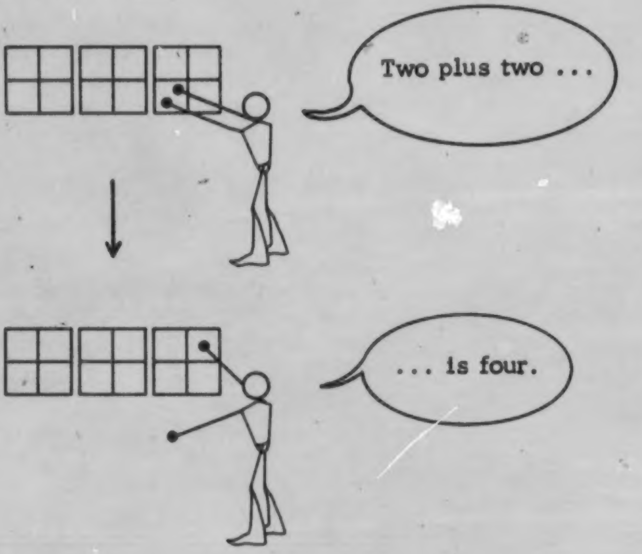


T: I am going to add 2 to the number on the Minicomputer.

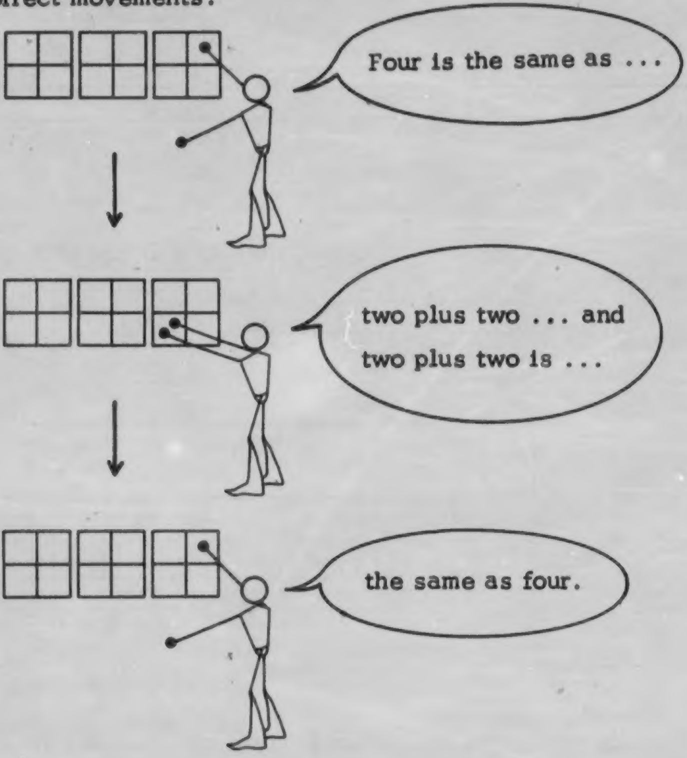
Put another checker on the red square of the ones' board.

T: What number is on the Minicomputer now? (4)
How do you know? (2 + 2 = 4)
Who can put 4 on the Minicomputer in another way?

If necessary, help the students to use both hands and say, "Two plus two is four," as they make the play.


Two plus two ...
... is four.

Briskly make the "4 = 2 + 2" and "2 + 2 = 4" plays again yourself, emphasizing the correct movements.


Four is the same as ...
two plus two ... and
two plus two is ...
the same as four.

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T: I am going to add 2 to the number on the Minicomputer.

Put a checker on the red square of the ones' board.

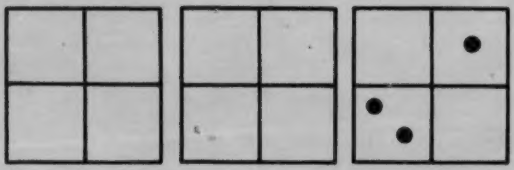
T: What number is on the Minicomputer now?

S: 6.

Put another checker on the red square of the ones' board as you ask:

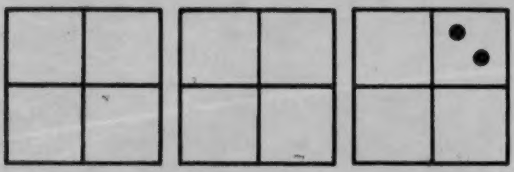
T: And two more than 6 is?

S: 8.



T (pointing to the two checkers on the red square): Who would like to make a play with these two checkers?

If necessary, remind the students that they should use both hands and say the number story aloud. After a student has made the "2 + 2 = 4" play, you should demonstrate the "4 = 2 + 2" and "2 + 2 = 4" plays yourself.

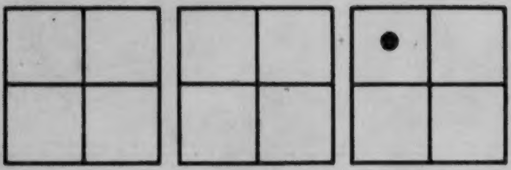


T: What number is on the Minicomputer? How do you know?

S: 8, because 4 + 4 = 8.

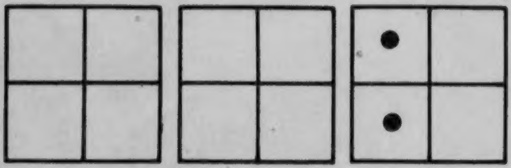
T: I would like to put 8 on the Minicomputer with only one checker. Who can make a play and do this?

If necessary, you might help the students by saying, "Four plus four is eight" as they make the play. When a student has made the "4 + 4 = 8" play, you should demonstrate the "8 = 4 + 4" and "4 + 4 = 8" plays yourself.



T: Now I am going to add 2 more to the number on the Minicomputer. What is this number? How do you know?

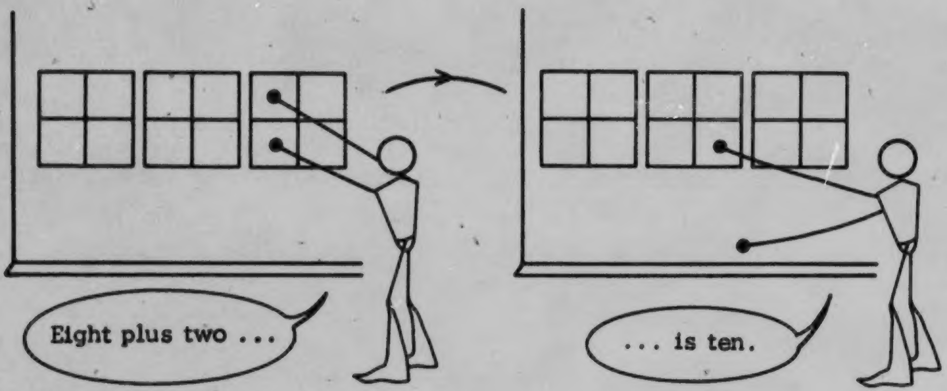
S: 10, because 8 + 2 = 10.



T: Can someone make a play and show 10 with only one checker?

If no one remembers the "8 + 2 = 10" play, point to the appropriate checkers and say "Eight plus two is ten." If necessary, make the play yourself.

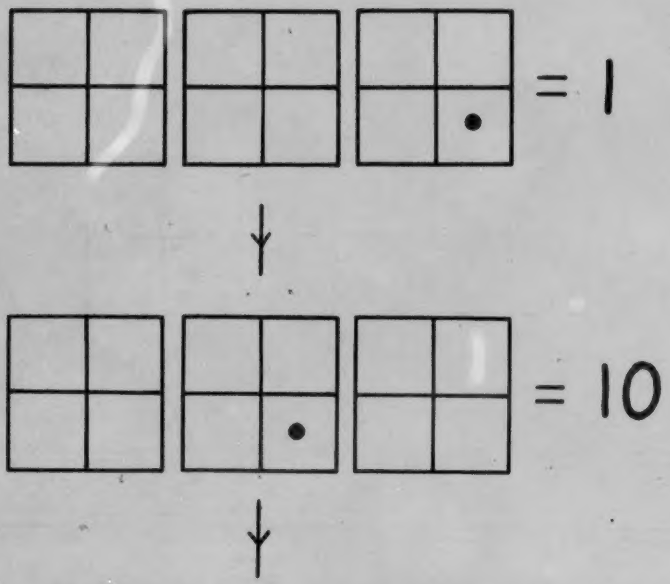
Repeat this play several times and have the students repeat the number story as you move the checkers for the "8 + 2 = 10" and "10 = 8 + 2" plays.

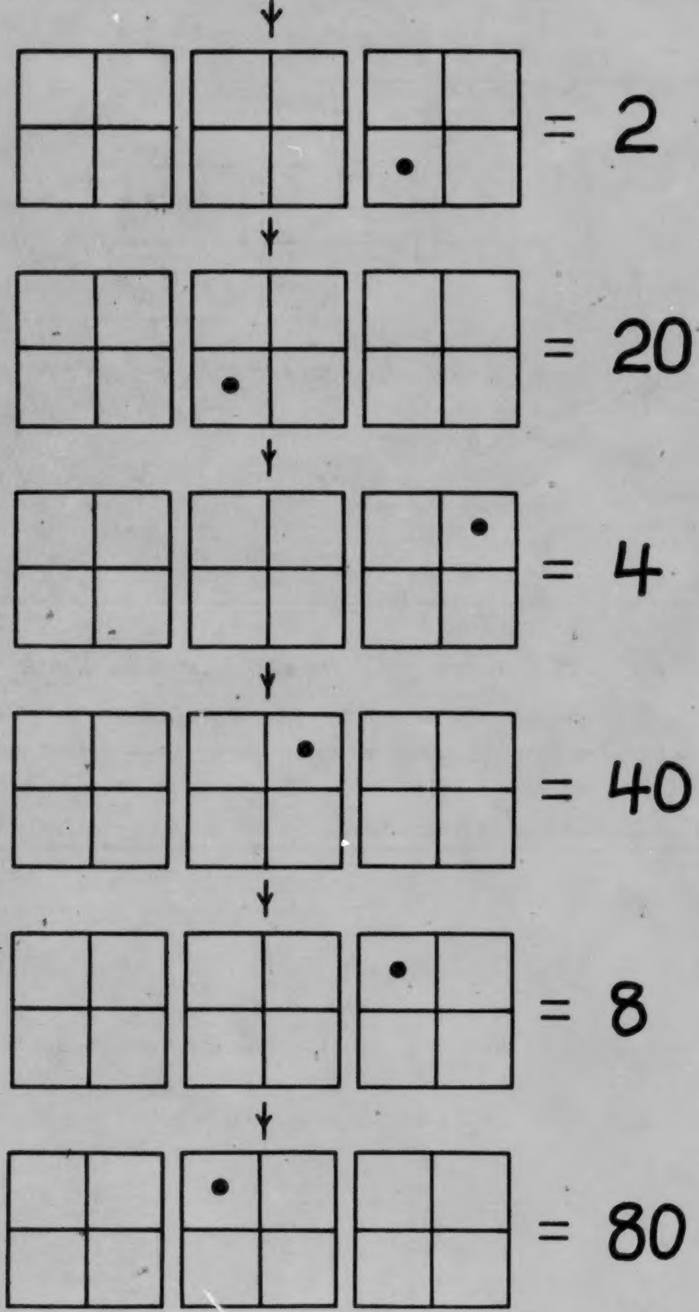


Exercise 2

Tell the students that you are going to move one checker to different squares on the Minicomputer and that they should tell you, after each move, what number is on the Minicomputer.

First, move the checker in the following sequence.



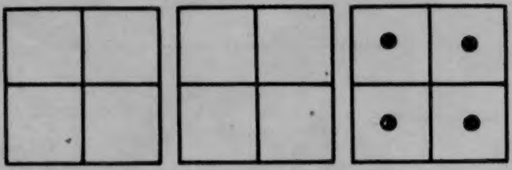


Next, move the checker randomly among the squares of the ones' board and tens' board.

F42

Exercise 3

Put these checkers on the Minicomputer.



T: What number is this? (15)

Ask for an explanation of a correct answer, but if no one knows the answer, do not reveal it.

T: Who sees a play we can make?

Point to the checkers on the brown and the red squares as the "8 + 2 = 10" play is suggested. If necessary, ask for a play with these two checkers, and help a student to make the play and say the number story.

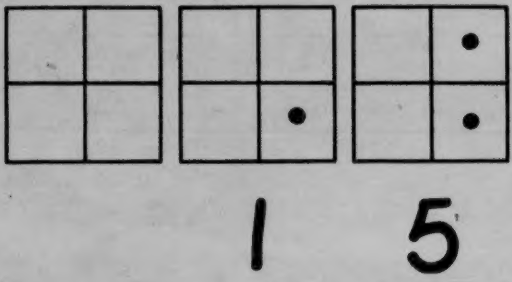
Standing to one side of the Minicomputer, point to the tens' board.

T: What number is on this board? (10)

Write a "1" below the tens' board saying, "Ten."

T: What number is on this board (point to the ones' board)? (5)

Write a "5" below the ones' board, saying, "Five."



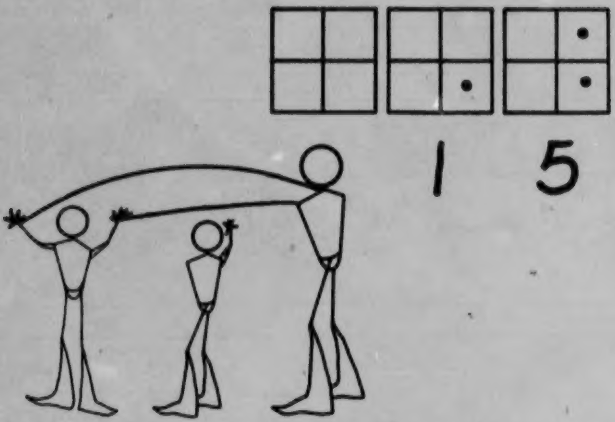
T: What number is on the Minicomputer?

S: 15.

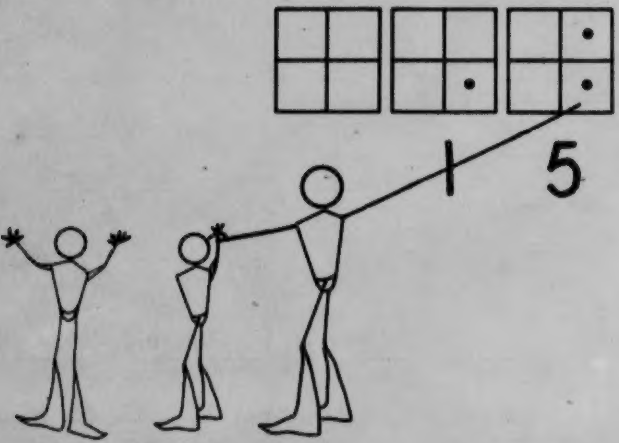
T: How many people would we need to show 15 fingers?

S: Two.

Ask two students to stand beside the Minicomputer. Have one of them hold up ten fingers and the other, five fingers. Stand behind the student who is showing ten fingers, hold the child's hands high, and say, "Ten . . ." Then point to the tens' board.



Stand behind the student who is showing five fingers, hold the child's hand high and continue, ". . . plus five is fifteen." Then point to the ones' board.



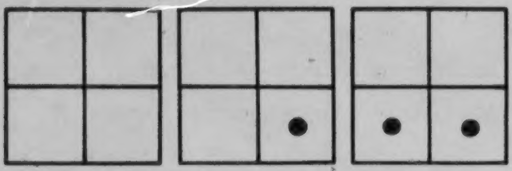
F 42

T: We have fifteen fingers and 15 is on the Minicomputer.

If the lesson has moved quickly thus far, continue with Exercise 4.

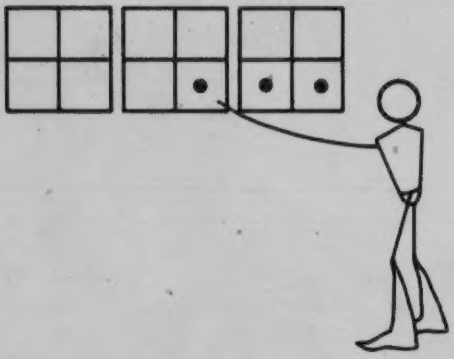
Exercise 4

Put this number on the Minicomputer.



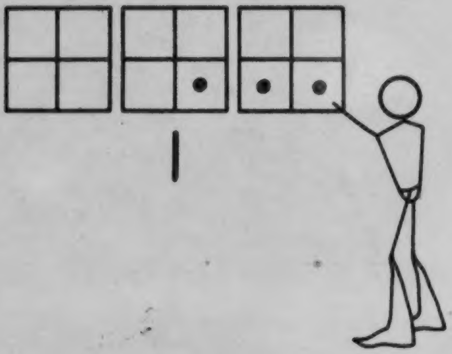
T: What number is on the Minicomputer?

S: 13.



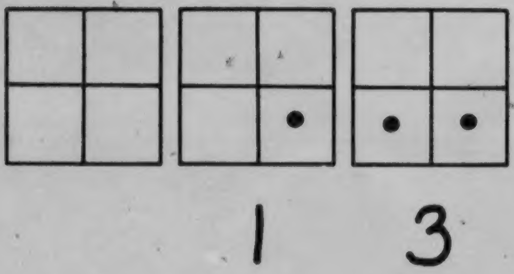
T: Which number is on this board? (10)

Write "1" below this board as you say, "Ten."



T: What number is on this board? (3)

Write "3" below the ones' board as you say, "Three."



Point to the appropriate checkers as you say:

T: Ten plus three is thirteen.

Repeat this activity for some of these numbers: 16, 19, 26, 43, 82, 54. You may wish to ask the students to write the numeral below the Minicomputer.

F 42

F42.2 Telling Stories for an Arrow Picture #1

CAPSULE LESSON SUMMARY

Tell stories that could be the interpretation of a picture with dots, strings, and arrows.

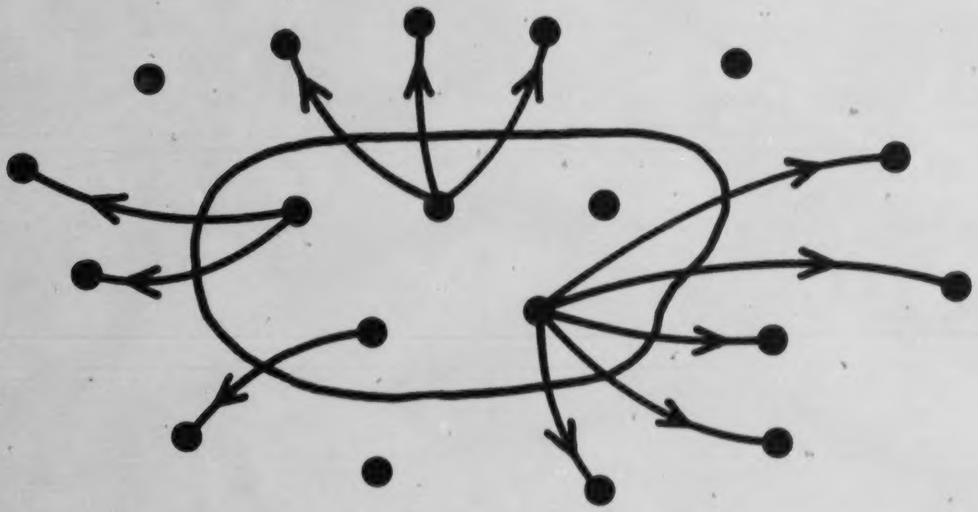
MATERIALS

Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

Draw this picture on the board.



T: Usually, I tell you the story to go with our picture. Today, it is your turn to make up the story. Try to think of one that could go with this picture.

You may need to help the students during their stories, ensuring that the stories are explicit about the following points:

- What are the dots inside the string for?
- What are the dots outside the string for?
- What are the arrows for? (The arrows should all have the same meaning within a story.)

Here is a sample story, with the teacher's commentary.

S: My story is about pets.

T: Where are they in the picture?

S: Outside the string.

T: What are the dots inside of the string for?

S: Children.

T: What do the arrows tell us?

S: The children are saying "you are my pet."

Some additional questions about the story could now be posed; for example,

T: Which child has the most pets?
How many pets does that child have? (Five)
Does every child have a pet? (No)
Point to a child with two pets.

Ask for other interpretations of the picture. The students may begin to suggest only variations of the first story. In this case, ask who has a story which is not about pets. Some stories may need a great deal of altering before they fit the picture. Suppose a story with the following main characters is suggested.

Inside the string: Children
Outside the string: Mothers
Meaning of the arrows: "You are my mother"

Let the students discuss the story, guiding them to discover that in this story, several children seem to have more than one mother, an impossibility! The class may eventually suggest that mothers could be inside the string and children could be outside the string. The arrows could then mean "You are my child".

If you cannot see a way to modify a story so that it fits the picture, say,

T: That is a very nice story but it does not seem to fit our picture.

You may want to draw a second picture which illustrates the student's story, if this is possible.

F43.1 Counting Activity #2

CAPSULE LESSON SUMMARY

As a group, count forward, backward, and by twos.

MATERIALS

Teacher: None

Student: None

DESCRIPTION OF LESSON

Exercise 1

Remind the students of the counting activity they did about a month ago (Lesson F23.2).

T: Today, you can probably count much better than you could a month ago. We are going to count by ones today; I will point to each of you in turn. The first person to whom I point will say "one" ; the second person will say "two" ; and so on. Let's see if we can do it without any mistakes.

Walk up and down each row, or around each table, pointing to the students in order until each has participated. The last number to be counted is the total number of students in class.

T: How many students are there in class today?
We are going to count by ones again. As I point to each of you, you should say whichever number comes next; but this time, a different student will begin the counting. Which number will the very last student say?

The students will probably agree that this number will be the same as the last number counted previously.

Beginning with a different student, walk up and down the rows, or around each table, pointing to the students in order until each has participated. Acknowledge those students who had correctly predicted the last number to be counted.

Exercise 2

If the previous exercise was successful, conduct this activity with the entire class. However, if the students begin to have difficulty paying attention, conduct the activity with just one row or table of students at a time.

T: We are going to count forward by ones and then we will count backward by ones. As we count forward and you say a number, try to remember which number it is.

Start with a different student and ask the class to count by ones as in Exercise 1. Continue until each student has participated. This sample dialogue is for a class of 26 students.

T: Now we are going to count backward by ones.

Point to the student who counted last.

T: What was your number?

S: 26.

Point to the student who was next to last.

T: What was your number?

S: 25.

Continue in this manner, pointing to each student in an order exactly the reverse of the forward counting. You may also wish to point to the appropriate place on the number line as a number is said.

If this activity goes well continue by having the class count by twos starting at 0; this may be done collectively at first and then individually as in Exercise 1.

F 43

F43.2 Candies to Share

CAPSULE LESSON SUMMARY

Share 12 candies equally among some children. Draw string pictures and write number stories for the different ways of sharing.

MATERIALS

Teacher: Colored chalk

Student: Colored pencils; unlined paper

DESCRIPTION OF LESSON

Draw 12 dots on the board. Ask the students to count silently as you draw.

T: These are lemon drops. How many are there?

S: 12.

T: We are going to share all of these candies among some children. Try to give the same number of candies to each child. How many lemon drops should we give to each child?

S: How many children are there?

T: That's a good question. You can decide how many children to give candies to, but remember we would like to give the same number to each child.

Joani wants to give each child three candies. Someone show us the three candies one child will receive.

Have a student come to the board and point to three candies. With colored chalk, draw a string around the candies chosen.

T: We would give these three candies to one child. Who can show the candies we would give to a second child?

Continue until all of the candies have been distributed. If a student suggests sharing a number of candies other than three, you should remind the class that each child is to receive the same number of lemon drops.

T: Who would like to explain this completed picture to us?

S: There are twelve candies and each child gets three.

T: Let's write a number story for this on the board.

Write "12" on the board. Point to each string individually and record the number of candies in each string.

$$12 = 3 + 3 + 3 + 3$$

T: How many children received candies? (Four)
How many times did I write "3" in this number story? (Four)
Four times three is twelve. Here is a short way to write this.

$$12 = 3 + 3 + 3 + 3 = 4 \times 3$$

Read this number story for your class.

T: Twelve is equal to three, plus three, plus three, plus three . . . which is equal to (or the same as) four times three.

In the preceding dialogue, the class decided to give each child three of the twelve candies; your class, however, may decide to give each child a different number and may arrive at a different outcome.

For example, your students may suggest giving each child five candies; two candies will be left over. Accept this suggestion, but mention that this way you will not be able to share all of the candies. Record the addition number story on the board as before, but postpone introduction of a multiplication story.

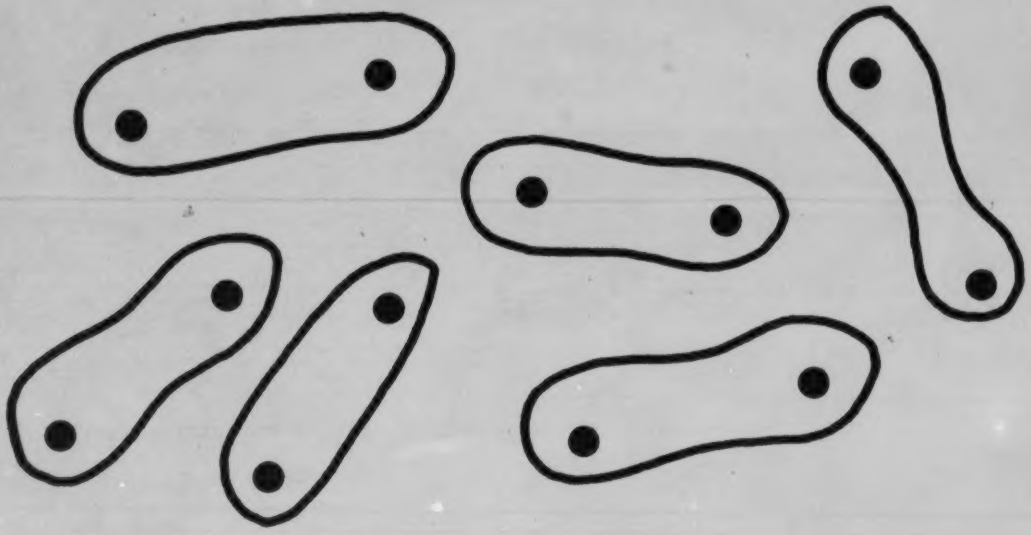
$$12 = 5 + 5 + 2$$

Erase your drawing, leaving the number story on the chalkboard.

Distribute sheets of unlined paper and explain to the students that they should draw exactly 12 dots on their papers. They may share the 12 candies in any way they wish, but every child should receive the same number of candies. Students who finish quickly should try to find other ways of sharing 12 candies equally.

As the students work, circulate among them to find neatly-drawn pictures showing different number stories. When many of the students have finished, ask a student whose drawing is clear and correct to hold up the picture for the class to see. Ask a second student to describe this picture, as you record the appropriate number story on the board.

A picture like this one, for example, could lead to the following dialogue.



S: In this drawing, each child gets two candies.

T: How many candies are there all together?

S: 12.

T: How many children received candies?

S: 6.

T: Let's write the number story for this on the board.

F 43

Under the original number story, write this one.

$$12 = 2 + 2 + 2 + 2 + 2 + 2$$

T: How many times did I write "2"? (Six times)
Could we write this story another way?

Encourage the class to think about a multiplication story. You may have to explain that another way to write "2 + 2 + 2 + 2 + 2 + 2" is "6 × 2". Read the number story to the class.

$$12 = 2 + 2 + 2 + 2 + 2 + 2 = 6 \times 2$$

Examine and discuss several students' drawings until several number stories are on the board. Include one drawing in which some candies were left over. Here is a possible dialogue for a picture showing five candies given to each child.

S: Two children each get five candies, and two candies are left over.

T: How many candies all together? (Twelve)
How many children? (Two)
How many candies did each child get? (Five)
How many candies left over? (Two)
Let's write this story on the board.

$$12 = 5 + 5 + 2$$

T: How many times did I write "5"?

S: Two.

T: Could we write this story another way?

The class will probably suggest that "5 + 5" can be written as "2 × 5". Explain that 2 × 5 = 10 and there are 12 candles. Give the students an opportunity to make suggestions and then add "= (2 × 5) + 2" to your number story on the board.

$$12 = 5 + 5 + 2 = (2 \times 5) + 2$$

T: There are two children with five candies and two candies are left over.

Point to the parentheses and casually explain:

T: These parentheses tell us to calculate this part of the number story first.

336

F 44

F44.1 Plays on the Minicomputer #3

CAPSULE LESSON SUMMARY

Make usual Minicomputer plays so that a number on the Minicomputer is easier to read.

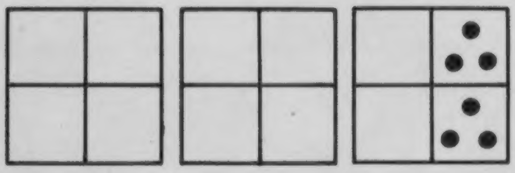
MATERIALS

Teacher: Minicomputer set

Student: None

DESCRIPTION OF LESSON

Display three Minicomputer boards, with six checkers placed as shown.



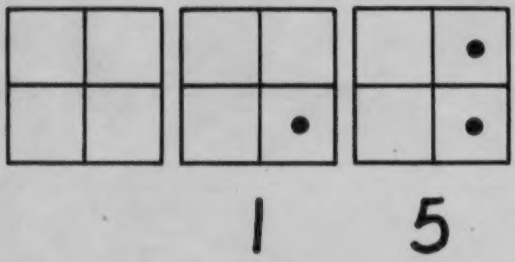
T: This is my secret number. Does anyone know what my secret number is? (15)

Allow several children to whisper the number to you.

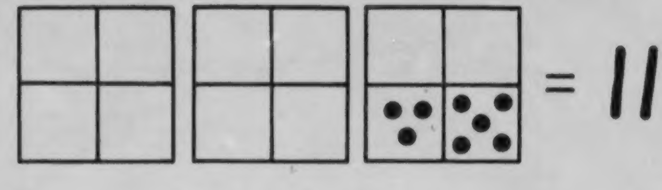
T: With all these checkers, it is hard to tell what my secret number is. Does anyone see a play we could make?

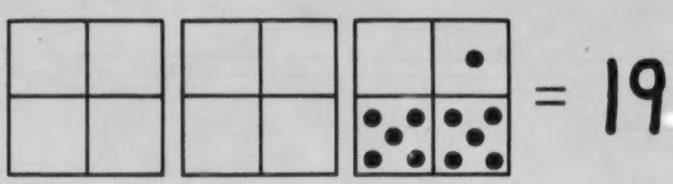
It may be necessary for you to make the first play yourself. If so, make the "4 + 4 = 8" play; otherwise, it does not matter which play a student makes first. Emphasize the use of both hands and the removal of the "extra" checker from the Minicomputer. Ask students to say the appropriate addition fact as they make a play. Continue until all plays have been made.

Ask a student to write the appropriate numeral below the Minicomputer. Commend those students who had whispered the correct answer.



Repeat this activity with one or two more secret numbers.





F 44

F44.2 + 2 Spiral

CAPSULE LESSON SUMMARY

Draw and label the dots of a spiral arrow picture with arrows for + 2. Associate counting by twos with adding two.

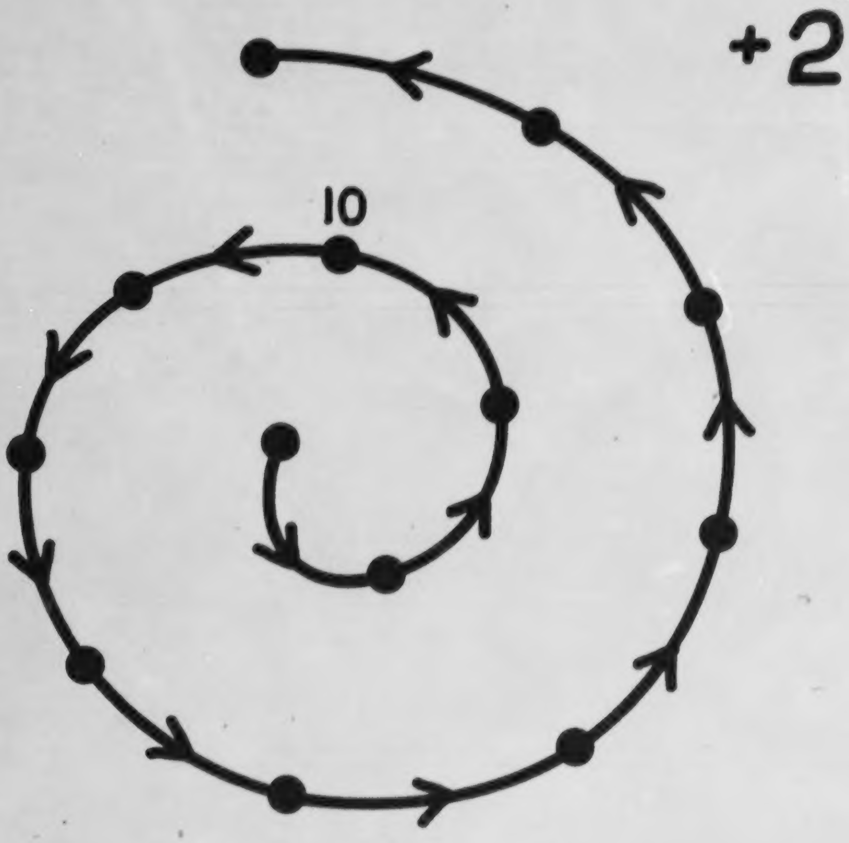
MATERIALS

Teacher: Colored chalk

Student: Worksheets F44.2* and **

DESCRIPTION OF LESSON

Draw this large + 2 spiral on the board.



T: The dots are for numbers and the red arrows are for + 2. Here is 10 (point to the dot labeled "10").

Trace the arrow starting at 10 to the next dot on the spiral.

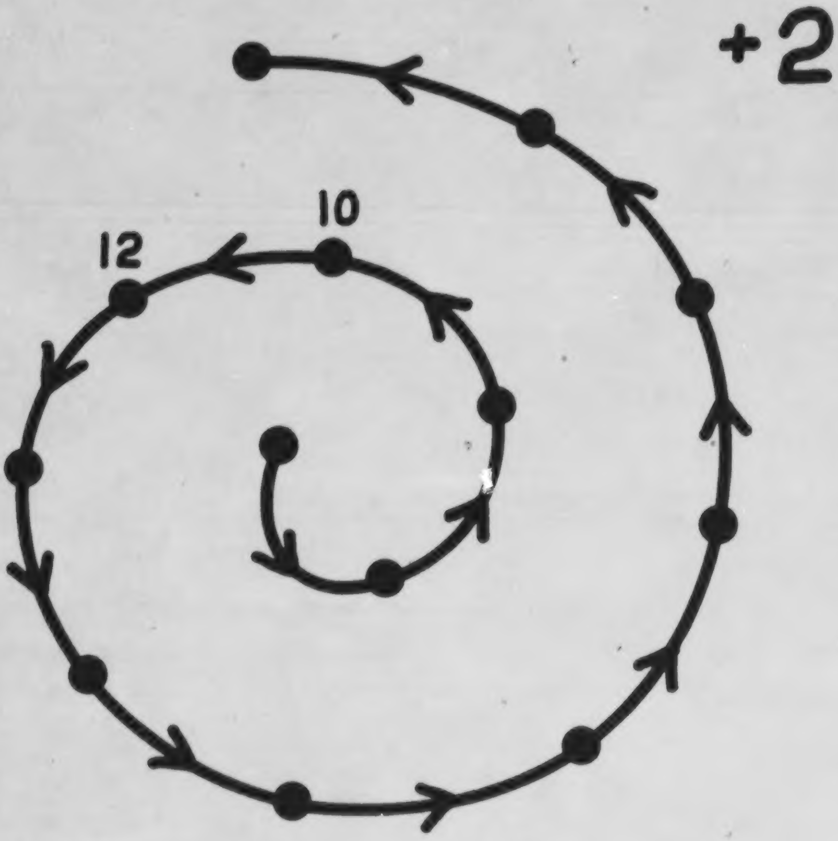
T: Which number is here?

S: 12.

T (tracing the arrow again): Ten . . . plus two . . . is twelve. Yes, that is correct.

Also demonstrate adding two on the number line starting at 10 and moving two spaces (in the positive direction) as you say, "Ten plus two is twelve." To demonstrate adding two another way, you could hold up two fingers as you say, "Ten plus two is . . . ", and then count the fingers, ". . . eleven, twelve."

After these checks have been made, label the dot "12" and continue.



T: Who can label another dot?

Students should feel free to suggest labels for any dot on the spiral.

Have a student point to a dot, say which number is there, and then, if correct, label it. Since this activity is open, there are many kinds of student responses. Here we suggest only a few possibilities.

A student may wish to label the next dot on the spiral following one that has already been labeled. Check such a response by again demonstrating adding two on the number line and with fingers.

A student may wish to label the dot immediately preceding one that has already been labeled. For example, a student might point to the dot preceding 10 on the spiral.

S: 8.

T (tracing the red arrow from the dot to 10): Eight . . . plus two . . . is ten. Is that correct?

S: Yes.

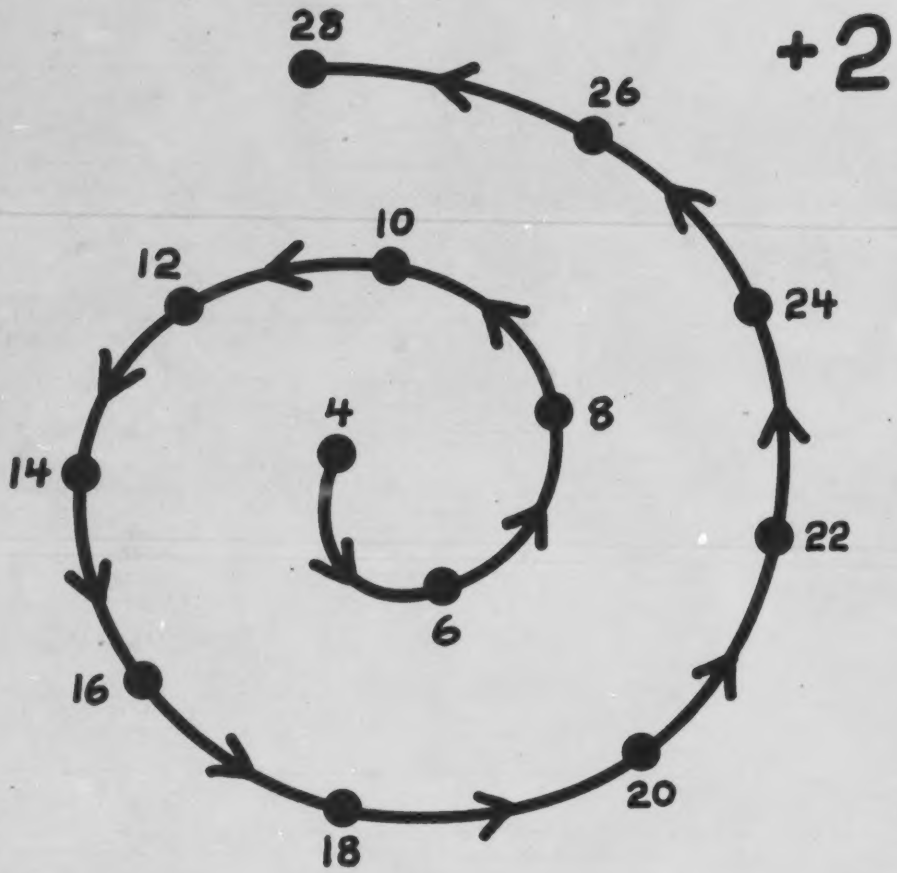
Check this addition problem on the number line and with fingers as before.

A student may wish to label a dot which does not immediately precede or follow a labeled dot on the spiral. In this case, accept the response with the comment:

T: You may be correct. We will have to check your idea after we have labeled these other dots (point to any unlabeled dots between the suggested one and a labeled dot).

NOTE: If the student in this case is correct and, you believe, could explain his or her answer, you might ask for an explanation. Do not, however, press for too precise an explanation.

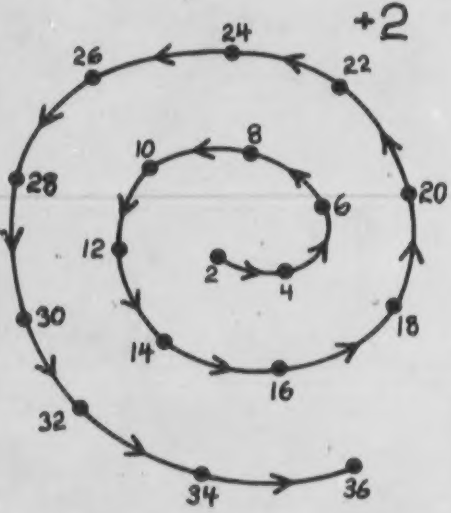
Continue in this manner until all the dots on the spiral have been labeled. A completed picture is shown below.



Distribute Worksheets F44.2* and **. Students should begin with the * worksheet, and those who complete it correctly should proceed to the ** worksheet.

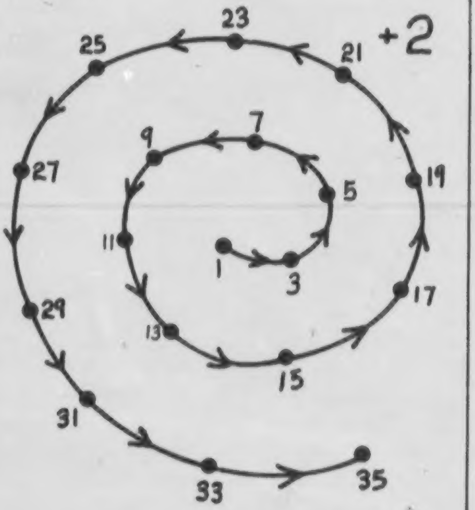
Name ________________ F44.2 *

Label the dots.


+2
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36

Name ________________ F44.2 **

Label the dots.


+2
1
3
5
7
9
11
13
15
17
19
21
23
25
27
29
31
33
35

F45 The Numbers Speak #3

CAPSULE LESSON SUMMARY

Review the "is less than" and "is more than" relations. Determine where the smallest and largest numbers are in an arrow picture with arrows for "is less than". Explore various ways to label the dots of the arrow picture. Compare the "is less than" relation between numbers with the "is shorter than" relation between people.

MATERIALS

Teacher: Colored chalk

Student: Colored pens, pencils or crayons; unlined paper

DESCRIPTION OF LESSON

Tell the class that you are going to begin a sentence and each time one of them will have to complete it. This is only a sample dialogue; you should adjust it to fit your students' responses.

T: 10 is less than . . .

S: 11.

T: 11 is less than . . .

S: 15.

T: 15 is less than . . .

S: 20.

T: 20 is less than . . .

S: 30.

F 45

T: 30 is less than . . .

S: 100.

T: Be careful now; 100 is more than . . .

S: 50.

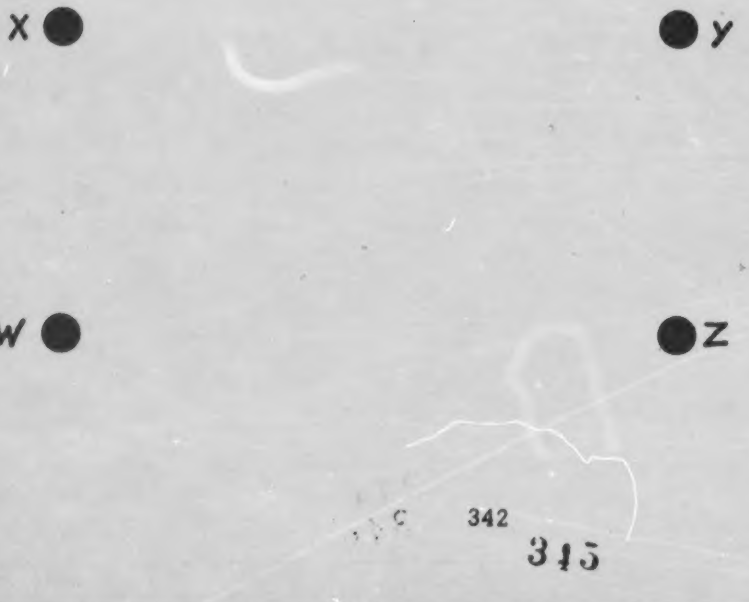
T: 50 is more than . . .

S: 18.

Continue this at a brisk pace as long as student interest remains. If students begin to respond with consecutive numbers, such as 10 . . . 11 . . . 12 . . . 13, skip ahead by answering yourself.

T: 13 is less than 20. 20 is less than . . .

When interest begins to fade, stop and draw four dots on the board.



Do not write the letters on the board. They are here just to make the description of the lesson easier to follow.

T: These are some numbers I met on the way to school this morning. How many numbers did I meet?

S: Four.

T: These numbers were fighting because each of them claimed to be the largest. I told them you could help solve the problem, after I had given you several clues.
Here are the first clues. This number (point to w) says "I am less than you" to this number (point to x).

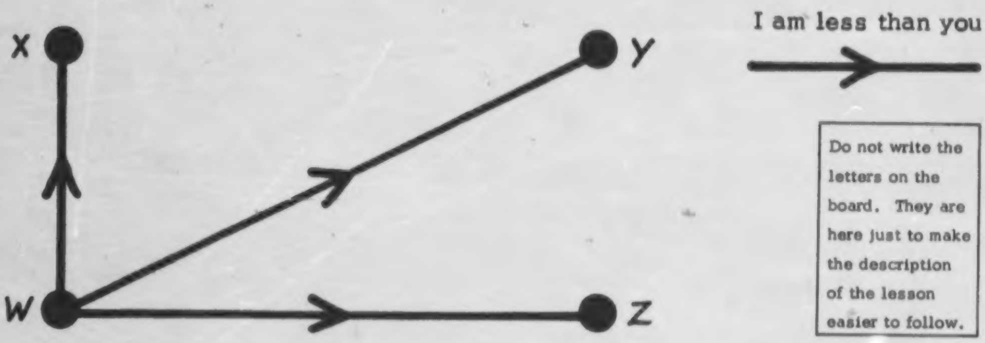
Draw a red arrow starting at w and ending at x.

T: This number (point to w again) says "I am less than you" to this number (point to y).

Draw a red arrow starting at w and ending at y.

T: This number (point to w) says "I am less than you" to this number (point to z).

Add the "key" arrow to your picture on the board.



Do not write the letters on the board. They are here just to make the description of the lesson easier to follow.

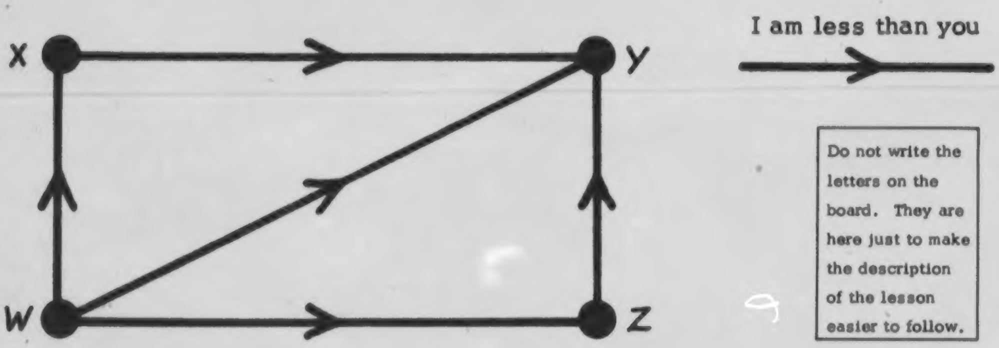
F 45

T: Now, what do we know?

Allow the students to discuss the picture. They should agree that the only thing they know for sure is which number is the smallest (the number at w).

Add two new arrows (from x to y and from z to y) to your picture as you say:

T: This number (point to x) is less than this one (point to y).
This number (point to z) is less than this one (point to y).



Do not write the letters on the board. They are here just to make the description of the lesson easier to follow.

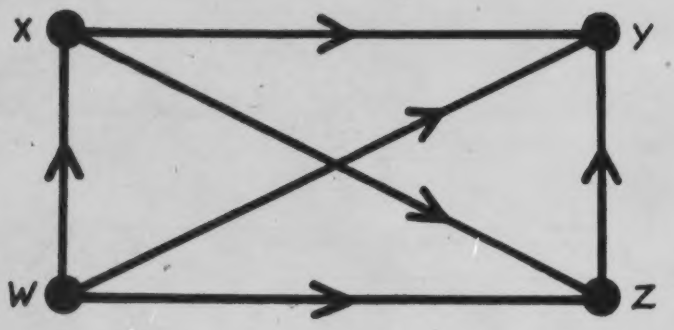
Allow the students to discuss this new information. Eventually, they should discover that the number at y is the largest number in the picture.

T: Which of these numbers (point to x and z) is larger?

S: It's impossible to tell!

T: You are right. I must give you another clue.

Draw an arrow from x to z.



I am less than you

Do not write the letters on the board. They are here just to make the description of the lesson easier to follow.

T: Now . . . where is the smallest number in this picture? (At w)
Where is the largest number in this picture? (At y)
What about the other two numbers?

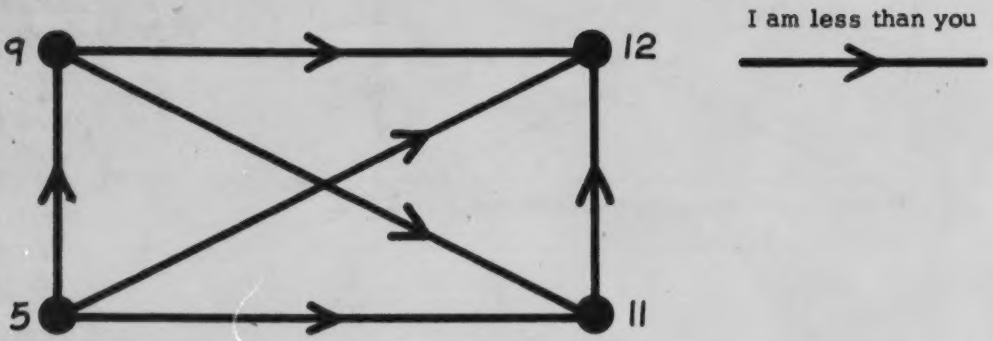
S: They are in between.

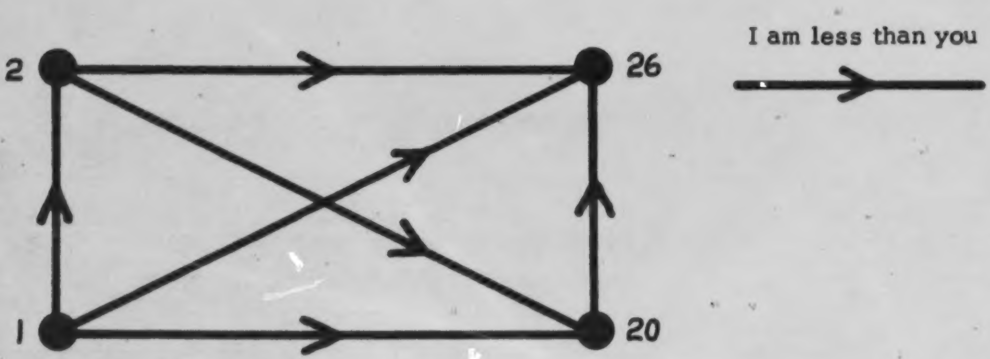
S: This one (x) is smaller than the other (z).

T: I knew you would be able to help the numbers solve their problem! Which numbers could these be? Remember, the red arrows are for "I am less than you."

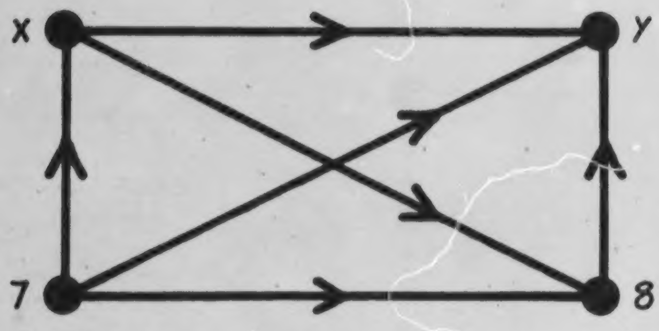
F 45

Explore this problem collectively, with two or three groups of suggested numbers; for example,

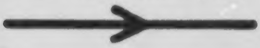

9
12
5
11
I am less than you


2
26
1
20
I am less than you

In the course of exploring the problem, this situation could develop.



I am less than you



Do not write the letters on the board. They are here just to make the description of the lesson easier to follow.

T: Which number could be here (point to x)?

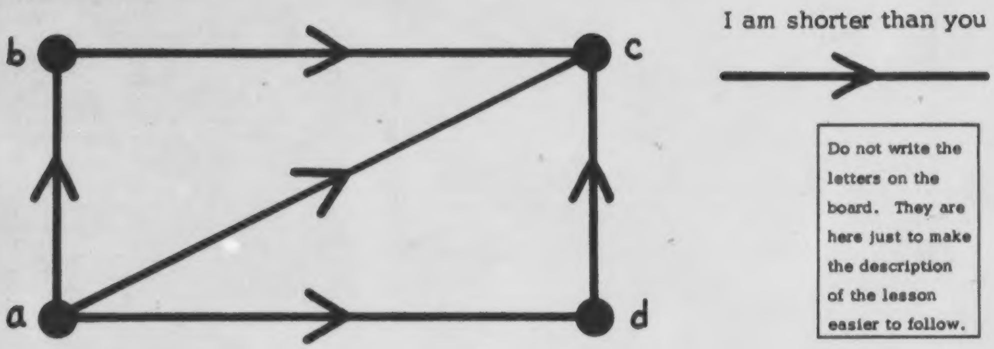
Only those numbers which are both greater than 7 and less than 8 could be here; most students will not be aware of any numbers between 7 and 8 and will probably decide that there are no such numbers. Guide the class into discovering this apparent conflict but comment simply, "You do not yet know any numbers between 7 and 8." If some student suggests a number between 7 and 8, such as "$7\frac{1}{2}$", accept this answer as correct, but do not emphasize it. Erase all labels and begin again.

Do not erase your final picture; leave it on the board for Exercise 2.

F 45

Exercise 2

Beside the previous arrow picture, draw this new one.



Do not write the letters on the board. They are here just to make the description of the lesson easier to follow.

T: These new dots are for people and the blue arrows are for "I am shorter than you". All the blue arrows have been drawn. What do we know about the height of these four people?

S: This person (the dot labeled "a") is the shortest; and this one (c) is the tallest.

T: What about the other two people?

S: They are the same height.

Distribute unlined paper. Instruct the students to draw dots for four numbers. label the dots, and then use one color to draw arrows for "I am more than you".

F46.1 Plays on the Minicomputer #4

CAPSULE LESSON SUMMARY

Begin with one checker on the 8-square and make backward plays until all checkers are on the 1-square.

MATERIALS

Teacher: Minicomputer set

Student: None

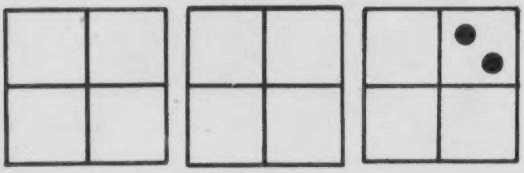
DESCRIPTION OF LESSON

Display three Minicomputer boards, and hold up one checker.

T: Who would like to put 8 on the Minicomputer with one checker?

Write "8" below the ones' board. Then, remove the checker from the 8-square and hold up two checkers.

T: Who can put 8 on the Minicomputer with two checkers?



Demonstrate the play yourself, stressing the use of both hands and saying, eight equals four plus four."

T: Show four plus four with your fingers. How many fingers all together?

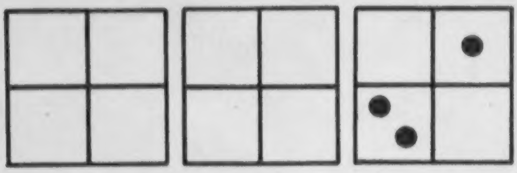
S: Eight.

T: Four plus four equals eight. Who can write the number story for this on the board?

F 46

When a student has done this, read the number story aloud. Then, hold up another checker.

T: Who can put 8 on the Minicomputer with three checkers?



Demonstrate the play yourself, stressing the use of both hands and saying, "four equals two plus two."

T: Show four fingers, plus two fingers . . . plus two more fingers. How many fingers? (Eight) Four plus two plus two equals eight. Who can write this number story on the board?

When this has been done, read the number story aloud. You may stop at this point or continue making backward plays, depending on the interest of your class.

F46.2 Goldy #3

CAPSULE LESSON SUMMARY

Review the symbols "<" and ">". Extend the use of these symbols in stories involving addition.

MATERIALS

Teacher: Chalk

Student: Worksheets F46.2*, **, ***, and ****

DESCRIPTION OF LESSON

Ask someone to tell the class about Goldy the Goldfish. Be sure the student includes the fact that, faced with two schools of fish, Goldy always eats the bigger of the two.

Write these two numerals on the board.

8 5

T: How many fish are in this school (point to "8")?

S: Eight.

T: How many are in this one (point to "5")?

S: Five.

T: Who can draw Goldy's mouth to show which school of fish Goldy would eat?

F 46

Choose a student to draw Goldy's mouth.

$$8 > 5$$

T: Yes. 8 is more than 5.

Put this information on the board:

$$5+2 \qquad 6$$

T: Who can draw Goldy's mouth?

Ask a student to do so.

$$5+2 > 6$$

T: Is this correct?

S: Yes; 5 plus 2 is 7, and 7 is more than 6.

Continue with this information on the board.

$$5+2 \qquad 4+3$$

T: Who can draw Goldy's mouth?

S : They're the same.

S : They're both 7 .

S : Goldy can't decide!

Invite a student to show that Goldy cannot decide.

$$5+2=4+3$$

T : Yes; 5 plus 2 equals (or is the same as) 4 plus 3 .

Distribute worksheets F46.2* and ** and explain that students should draw Goldy's mouth to show which school of fish Goldy would eat; or to use " = " to show that Goldy cannot decide. Students who successfully complete the * and ** worksheets should proceed to the *** and **** worksheets.

Name ____________ F46.2 *

Write <, >, or =.

8	>	6
9	<	13
3	>	0
5	<	15
17	<	26
20	>	10
13	<	17
3	<	20

Name ____________ F46.2 **

Write <, >, or =.

2+2	>	3
6	<	5+3
2+3	<	6
7+2	=	9
5	<	4+2
3+3	<	7
9	>	4+4
0+4	=	4

Name ____________ F46.2 ***

Write <, >, or =.

3+2	=	2+3
2+6	<	5+4
3+3	>	4+1
6+5	<	6+6
10+2	=	9+3
3+8	<	4+8
12+3	=	13+2
11+5	>	12+2

Name ____________ F46.2 ****

Write <, >, or =.

2 × 3	>	5
4 × 2	<	9
2 × 2	<	3 × 2
2 × 5	=	5 + 5
5 × 3	>	2 × 4
8 × 2	>	9 + 5
2 × 6	=	6 × 2
3 × 0	<	3 + 0

F47.1 Addition on the Minicomputer #1

CAPSULE LESSON SUMMARY

Present an addition problem in a story situation and solve the problem on the Minicomputer. Write the corresponding number story.

MATERIALS

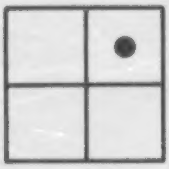
Teacher: Minicomputer set; colored chalk

Student: Unlined paper; colored pens, pencils or crayons

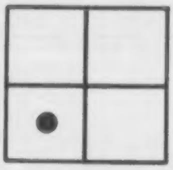
DESCRIPTION OF LESSON

At a brisk pace, put the following numbers on the Minicomputer one at a time and have the students show you what each number is by raising the appropriate number of fingers.

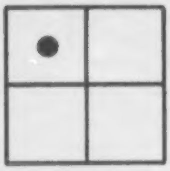
(4)



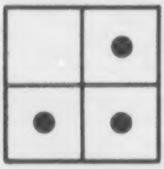
(2)



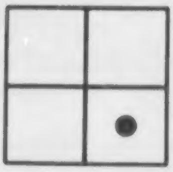
(8)



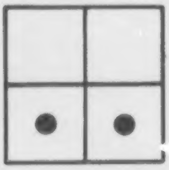
(7)



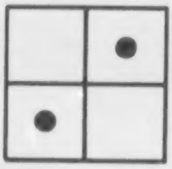
(1)



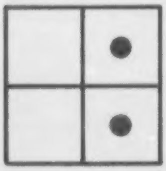
(3)



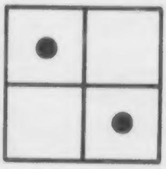
(6)



(5)

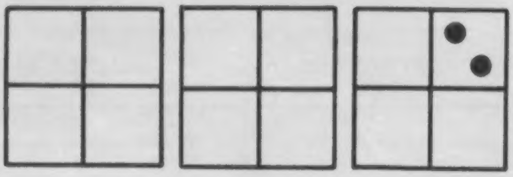


(9)



F 47

After this brief warm-up, put these checkers on the Minicomputer.



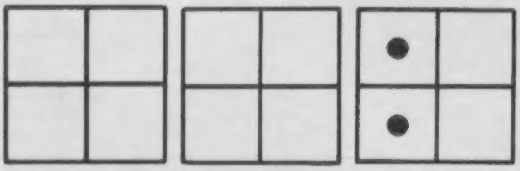
T: What is this number?

S: 8.

T: Who can put 8 on the Minicomputer with only one checker?

As a student does this, stress the correct use of both hands, and then demonstrate the "4 + 4 = 8" play yourself.

Follow the same procedure with this configuration, stressing the "8 + 2 = 10" play.



Distribute paper and colored pencils to each student.

T: Let's pretend that you are all zoo-keepers. In your zoo there are four lions. Draw a yellow dot on your paper for each lion.

Rather than drawing the dots on the board, write the numeral.

4

T: There are also six tigers in your zoo. Draw a blue dot for each tiger.

Continue the number story on the board.

$$4 + 6$$

T: One leopard. Draw a red dot for the leopard.

Extend the number story on the board.

$$4 + 6 + 1 =$$

T: How many animals are there all together?

S: 11.

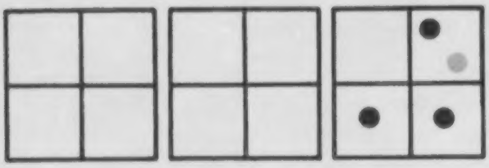
If only a few students give the correct answer, you could draw the dots on the board and count them collectively.

Complete your number story.

$$4 + 6 + 1 = 11$$

T: Let's tell the story on the Minicomputer.

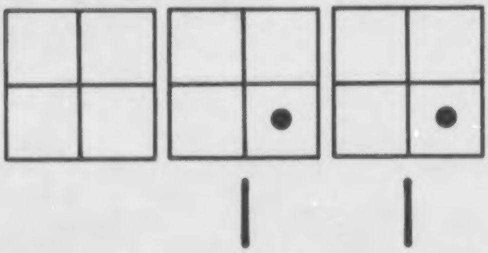
Ask a student to put 4 on the Minicomputer with yellow checkers for the four lions; another student to put 6 on the Minicomputer with blue checkers for the tigers; and ask a third student to put 1 on the Minicomputer with a red checker for the leopard.



T: What number is on the Minicomputer now?

S: 11.

Ask for suggestions of how to make it easier to read. You may have to suggest making plays yourself. Call on students to make plays until the standard configuration is obtained.



T: 11; this is what we found when we drew dots for the animals, isn't it?

If this activity has gone quickly, the students could use the reverse side of their papers to draw dots and tell another story with this number story.

$$7+5+2=14$$

F47.2 Telling Stories for an Arrow Picture #2

CAPSULE LESSON SUMMARY

Tell stories that could be the interpretation of a picture with dots, strings, and arrows.

MATERIALS

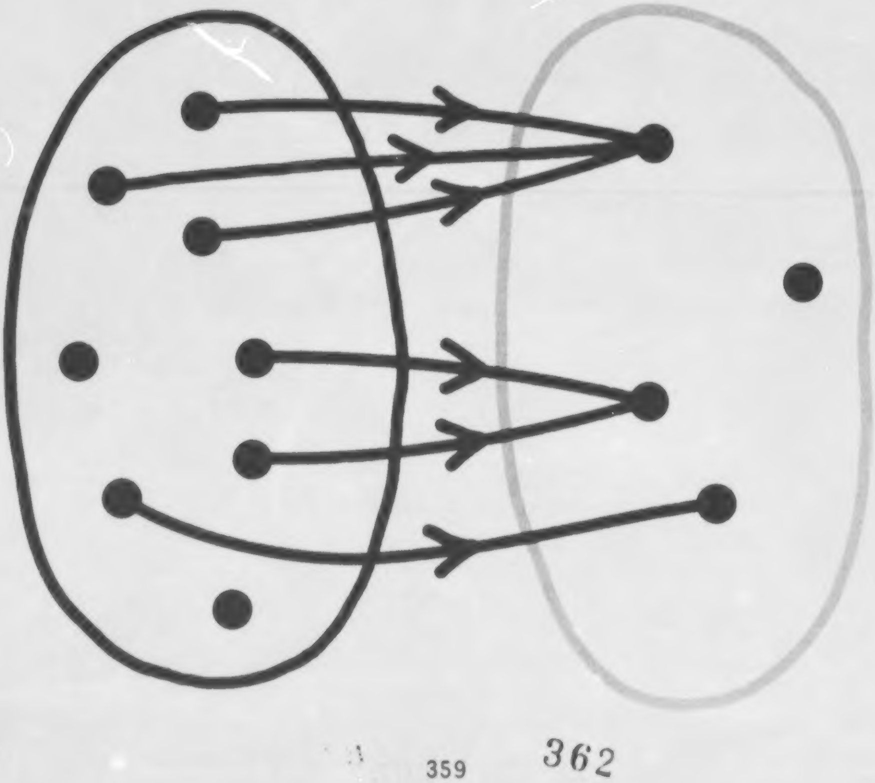
Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

T: Last week, I drew an arrow picture and you told stories to go with the picture. Today I'll draw a different picture and you can invent new stories to go with it.

Draw this picture on the board.



F 47

Once again, you may need to modify the stories as they are suggested, ensuring that they are explicit about the following points.

- What are the dots inside the red string for?
- What are the dots inside the yellow string for?
- What are the arrows for? (They should all be for the same thing within a story.)

Here is a sample story.

S: My story is about toys.

T: Where are they?

S: In the yellow string.

T: What are the dots in the red string for?

S: Children.

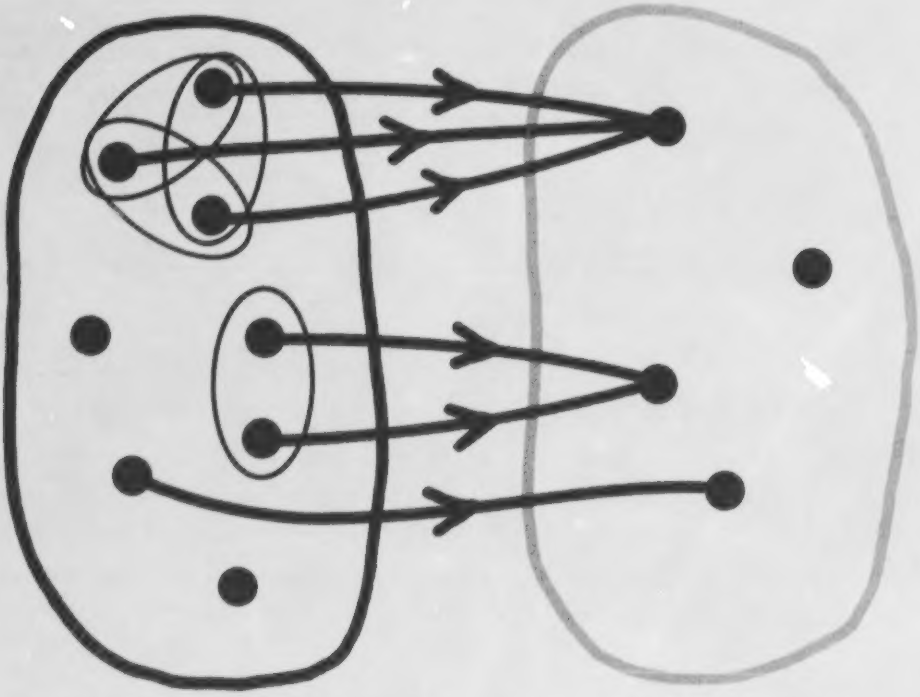
T: What are the arrows for?

S: I am playing with you.

Some additional questions about the story could also be posed; for example,

T: Which toy are most children playing with?
Is every toy being played with?
Can you point to two children who are playing with the same toy?

There are more answers to this last question than is at first obvious. Each black string in the picture below indicates a correct answer.



Ask for several other stories about this drawing. If students begin to suggest only variations on the first story, ask someone to tell a story which (in this example) is not about toys or children.

As in Lesson F42.2, some class discussion might be needed for stories that appear to conflict with the picture. For example, if a student suggests that the red string is for "mothers", the yellow string is for "children", and the arrows are for "you are my child", two children would have more than one mother, an impossibility! For such an example, the description of the strings could be reversed.

If a story cannot be salvaged through modification or discussion, say simply:

T: That is a very nice story but it does not seem to fit our picture.

You may want to draw a picture which does fit the student's story, if this is possible.

F 48

F48.1 Counting Activity #3

CAPSULE LESSON SUMMARY

Count forward by ones and by twos as a group activity. Predict beforehand which number will be said by the last person to say a number.

MATERIALS

Teacher: None
Student: None

DESCRIPTION OF LESSON

Exercise 1

Remind the students of the counting activity they had last week (Lesson F43.1), and how this was done: as you walked around the room and pointed, each student said a number in order.

NOTE: This activity will not be successful unless the students are attentive; employ your usual methods to hold the students' attention.

T: We are going to count by ones and go all around the room. When it is your turn, say the number which comes next.

Indicate which student will start and explain to the class the order you intend to use. You may wish to order the counting so that slower students will count earlier than others. Indicate the student who will say the last number, and ask the students to predict which number this will be. Record some of their predictions on the board. Be sure the class is ready before you begin.

Point to the student who will start the counting. If necessary, tell the student to say "one." Walk up and down each row or around each table, pointing to the students in order, until each has participated.

T: How many students are in our class today?

Call attention to the predictions on the board and commend the students who had correctly predicted this total.

T: Listen carefully. We are going to count again, but by twos this time. I will say the other numbers softly to myself. Try to remember the number you say.

Indicate the order in which the students will be counting. The class will count only the even numbers; say the odd numbers yourself. Begin by softly saying "one," then point to the first student who should say "two." Softly say "three," then point to the next student who should say "four." Continue until everyone has participated.

T: Now we will count by twos again, but this time, I won't say the other numbers.

Encourage the students to do their best, and point to the first student.

T: Which is your number?

S: 2.

Continue pointing to students in the same order as before. If someone had difficulty, you may either supply the correct number yourself or hold up two fingers and say, for example, "12 plus 2 equals . . . ?"

If the class remains interested, you may wish to count by twos again, changing the order of the students as they count.

F 48

F48.2 +1 and +2 Arrow Picture #1

CAPSULE LESSON SUMMARY

Label the dots in arrow pictures using both +1 and +2 arrows.

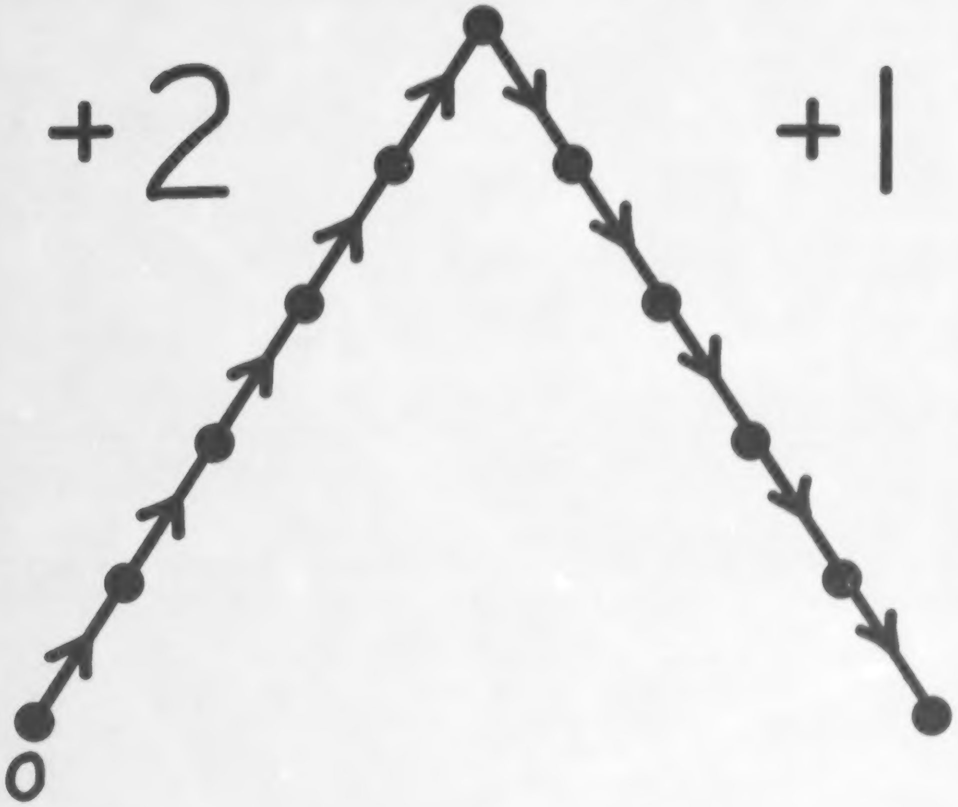
MATERIALS

Teacher: Colored chalk

Student: Worksheets F48.2*, **, ***, and ****

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



Allow the students to comment on the drawing. Emphasize that the red arrows are for + 2 and that the blue arrows are for + 1.

After some discussion, point to the dot at the top of this arrow picture.

T: Which number is this?

Do not reveal the correct number (10) at this time, but record several predictions on the board. Later, when this dot has been labeled, you should praise those students who correctly predicted the number. If many students accurately predict the number, you could ask them to also predict the number (15) which is at the ending dot to the lower right in the picture.

Point to the second dot from the left and invite a student to label it. Ask the class to check that it is correct.

T: "Is 0 plus 2 (trace the red arrow) equal to ____ ?"

Continue in this manner until all the dots on the left side of the picture, including the dot for 10, have been labeled. Then, point to the blue arrow beginning at 10.

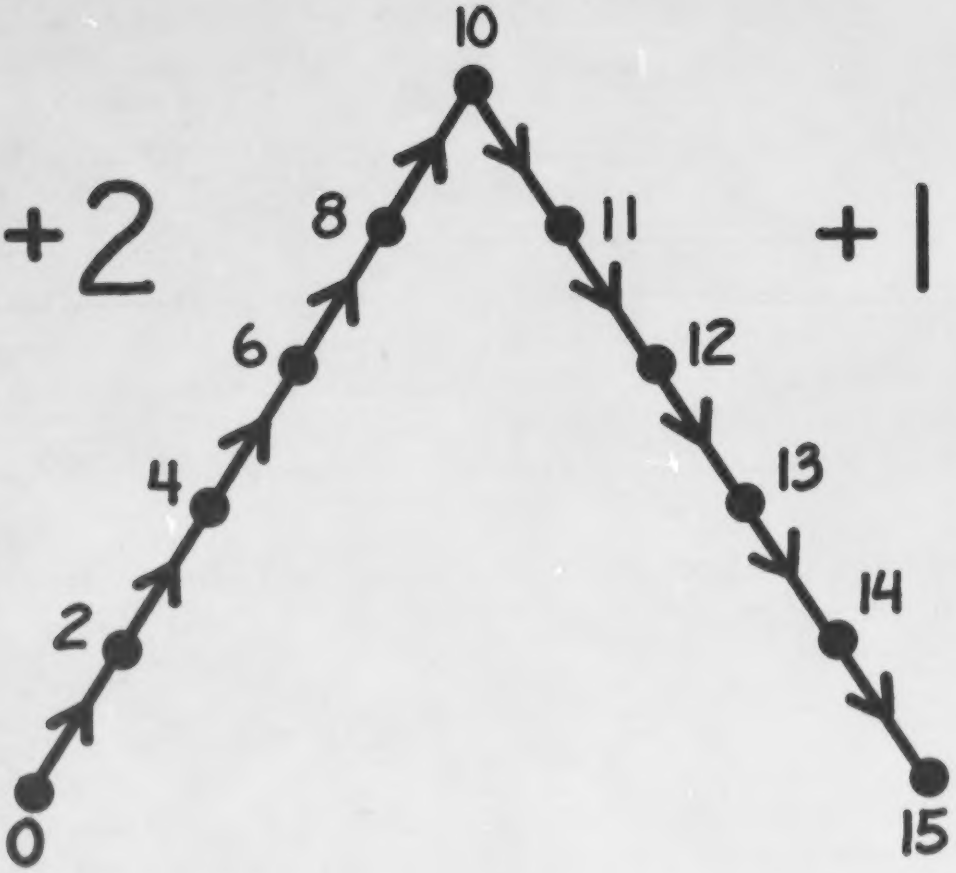
T: What is a blue arrow for?

S: + 1.

T: Who would like to label the next dot?

Proceed briskly until all of the dots in the arrow picture have been labeled.

F 48

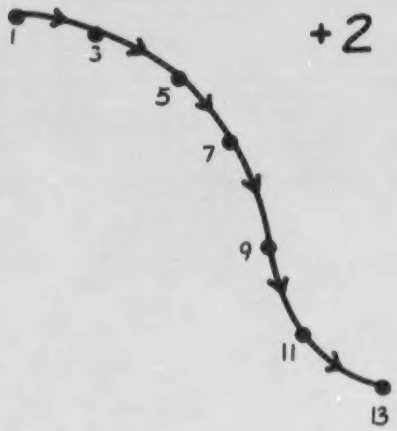

+2
0
2
4
6
8
10
11
12
13
14
15
+1

Worksheets F48.2*, **, ***, and **** are available for the remainder of the period.

Name ______________________

F 48.2 *

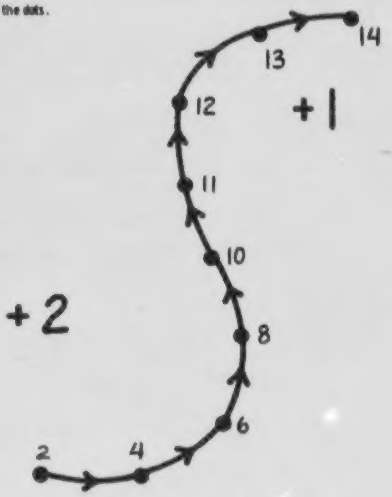
Label the dots.


1
3
5
7
9
11
13
+2

Name ______________________

F 48.2 **

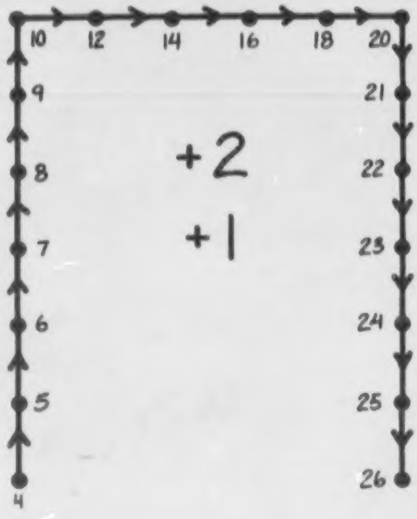
Label the dots.


14
13
12
+1
11
10
+2
8
6
2
4

Name ______________________

F 48.2 ***

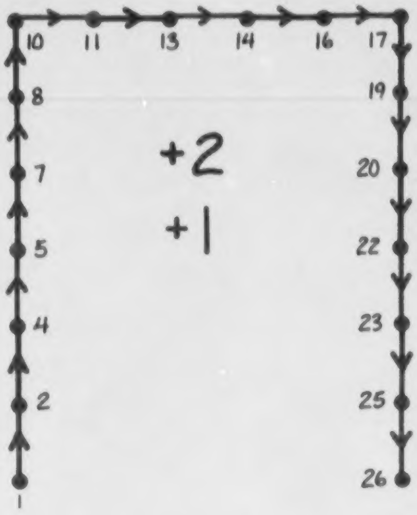
Label the dots.


10
12
14
16
18
20
9
21
+2
8
22
+1
7
23
6
24
5
25
26
4

Name ______________________

F 48.2 ****

Label the dots.


10
11
13
14
16
17
8
19
+2
7
20
+1
5
22
4
23
2
25
26
1

F 49

F49.1 Minicomputer Introduction #7

CAPSULE LESSON SUMMARY

Read and put numbers less than 100 on the Minicomputer.

MATERIALS

Teacher:	Minicomputer set
Student:	None

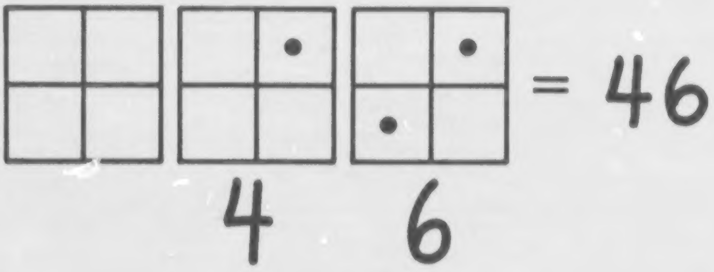
DESCRIPTION OF LESSON

Exercise 1

Display three Minicomputer boards. Tell the students that you are going to put various numbers on the Minicomputer and that they should whisper each number to you. You may wish to alternate easier numbers with more difficult ones so that the whole class remains involved in this activity.

Feel free to use any numbers up to 99 and to represent some of the smaller numbers in a non-standard configuration. Be sure to include many examples of numbers less than 10, especially if some of your students need this practice.

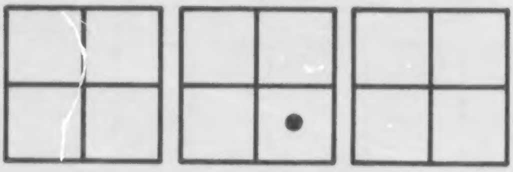
For each number, accept four or five whispers and then ask a student to answer aloud. If the number has two digits, you could also ask a student to write it below the Minicomputer. When the number is more than 9 you should occasionally write the numeral to one side of the Minicomputer with " = " between the Minicomputer and the numeral. For example,



This is especially appropriate when a student has written very small or widely-separated numerals below the Minicomputer.

Exercise 2

Put this number on the Minicomputer.

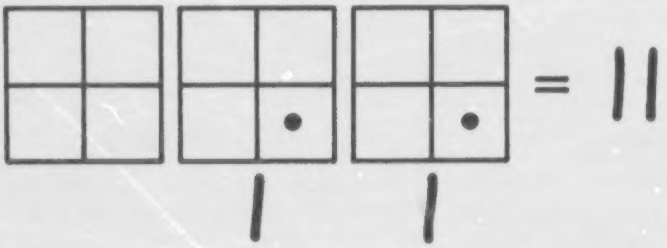


T: What is this number?

S: 10.

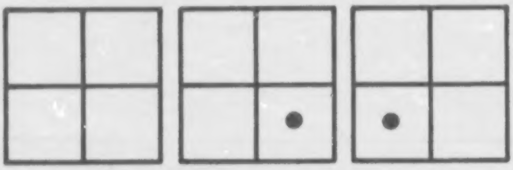
T: Who can put 11 on the Minicomputer?

Write "11" below and also to the side of the Minicomputer.



Remove the checker from the 1-square and erase the chalkboard.

T: This is 10; who can put 12 on the Minicomputer?

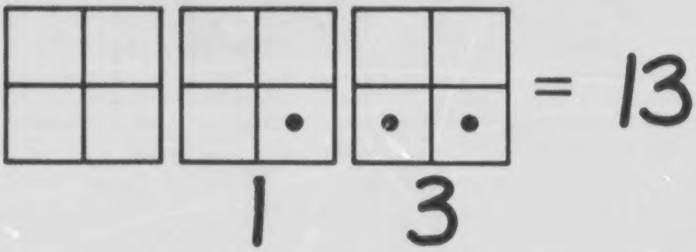


F 49

If the student puts 12 on the Minicomputer in a non-standard configuration, ask another student to make the appropriate plays to get the standard configuration. Write "12" below the Minicomputer.

T: This is 12. Who can put 13 on the Minicomputer?

Write "13" below and to the side of the Minicomputer.



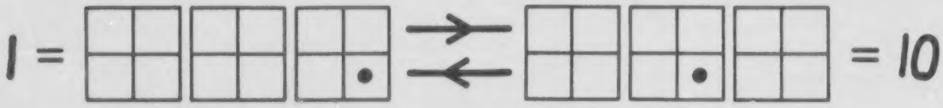
Remove the checkers from the ones' board and erase the chalkboard.

T: This is 10. Who can put 14 on the Minicomputer?

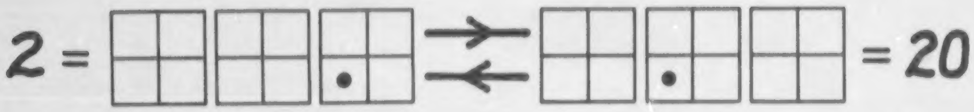
Continue this activity for as long as you feel your class is interested. Occasionally, ask a student to write the numerals below the Minicomputer.

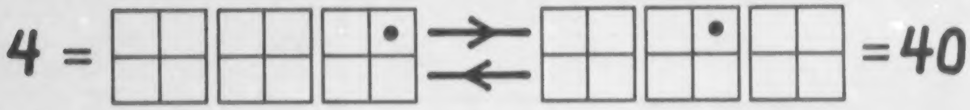
Exercise 3

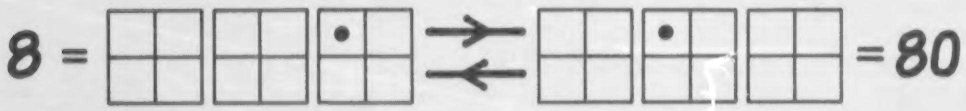
Quickly move a checker from the 1-square to the 10-square and vice versa. Lead the class in saying, "one - - ten - - one - - ten . . ." as you do this.



Continue this activity with the following numbers.





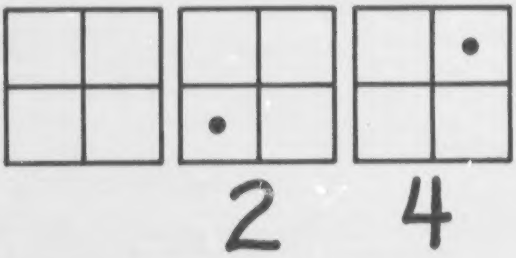


Exercise 4

Remove all the checkers from the Minicomputer.

T: Who can put 24 on the Minicomputer?

Who can write "24" below the Minicomputer?



F 49

Repeat this activity with 27 , 45 , 89 , and 31. If a student writes very small or widely-seperated numerals below the Minicomputer, write the numerals to one side of the Minicomputer yourself.

F49.2 Tangram Puzzles #2

CAPSULE LESSON SUMMARY

Continue as in Lesson F36.2 , to use all seven Tangram pieces to make various shapes.

MATERIALS

Teacher: None
Student: Cardboard Tangram pieces; Tangram booklet

DESCRIPTION OF LESSON

Continue solving the Tangram puzzles begun in Lesson F36.2 .

See Lesson F36.2 for solutions to the Tangram puzzles.

F 50

F50 Adjustment Day #5

NOTE: See the General Introduction, p. 16 for a full explanation of the purpose of scheduled adjustment days.

Today you may wish to repeat a previous lesson, either for a group of students, or for the entire class. Many of the lessons can be made to appear completely different by changing the story or the numbers. Lessons which you may wish to repeat include the following.

F38.2	+ 1 Spiral #2
F41.1	Addition Story #3
F42.1	Plays on the Minicomputer #2
F44.2	+ 2 Spiral

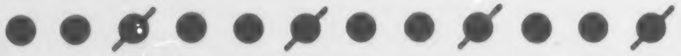
If you omitted any exercises or worksheets from any previous lessons, you may wish to pursue these today, after an appropriate warm-up activity.

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with F51 Plays on the Minicomputer #5.

The following activity may be appropriate for students who need extra help.

Special Dots

Draw some dots on the board, marking (for example) every third one. As you point to the dots, the student should count them silently, counting aloud only those "special" dots which have been marked.



S: (silently: one, two) THREE, (silently: four, five) SIX, . . .

EARLY WARNING !

Among the next nine classroom lessons are some which require extra preparation time, or which involve materials not included with the CSMP classroom set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (These special materials have been listed here only once, even if they are needed more than once during the nine-day period.)

F53 Introduction to Individual Minicomputers: container or envelope for each student's checkers

F57.2 A-Block Table: loops of masking tape

F 51

F51.1 Plays on the Minicomputer #5

CAPSULE LESSON SUMMARY

Introduce standard plays on the tens' board of the Minicomputer.

Put numbers larger than 100 on the Minicomputer.

MATERIALS

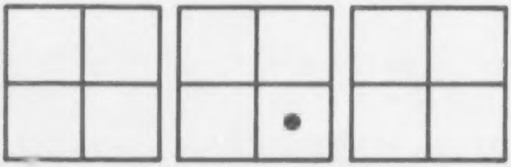
Teacher:	Minicomputer set
Student:	None

DESCRIPTION OF LESSON

Exercise 1

Display three Minicomputer boards. Using only one checker, quickly put on each of these numbers in random order: 1 , 2 , 4 , 8 , 10 , 20 , 40 , 80 . As you move the checkers from one square to another, ask the students to say each number.

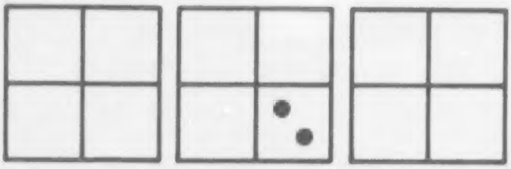
Put the checkers on the 10 -square.



T: Which number is this?

S: 10 .

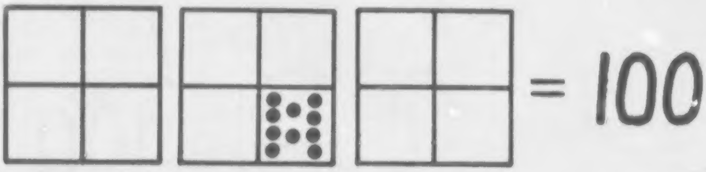
Put another checker on the 10 -square.



T: What number is this?

S: 20.

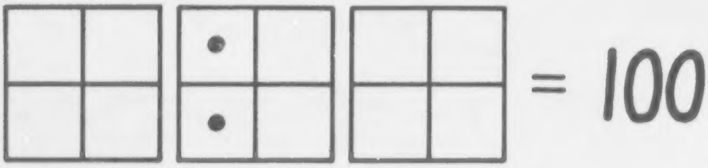
Continue this activity until there are ten checkers on the 10-square. Point to each checker as you count by tens with the students, and then write " = 100 " to one side of the Minicomputer.



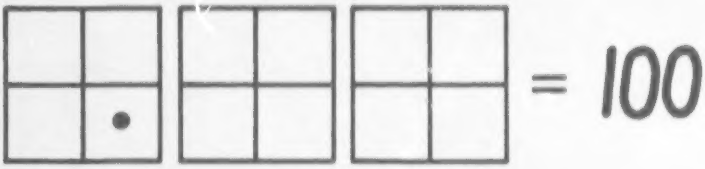
T: Who can make a play on the Minicomputer?

Invite a student to make a play and insist that the student use two hands. The student may make the play correctly, but may say "1 + 1 = 2". Casually point out that the play was made correctly, but that one should say "10 + 10 = 20" because the checkers are on the tens' board.

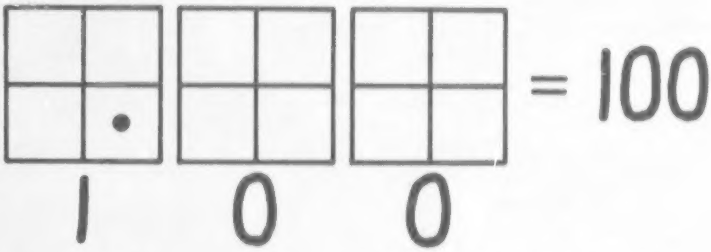
Continue asking for more plays until there is one checker on the 80-square and one checker on the 20-square.



Ask for another play to be made with these two checkers. A student may suggest the correct play, but may have difficulty verbalizing it. Be prepared to help, if necessary. This may be the first time your students encounter the standard configuration for 100; some children become very excited by this new discovery!



Repeat the "80 + 20 = 100" play yourself. Ask a student to write 100 below the Minicomputer.



T: There are many numbers which are more than 100 that we can put on the Minicomputer. Would you like to put some of these numbers on the Minicomputer?

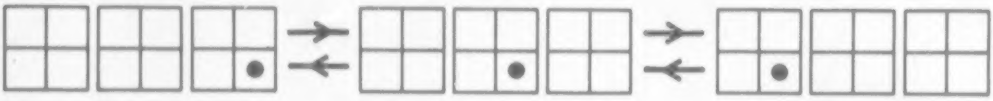
Invite students to put numbers of their choice on the Minicomputer. Ask a volunteer to write the appropriate numeral below the Minicomputer. Try to keep this activity as spontaneous as possible. A student may choose to put a certain number on the Minicomputer, but actually put on another number. You need not insist that the student put the chosen number on the Minicomputer, but insist that the number on the Minicomputer be read correctly.

If none of the students volunteers a number between 100 and 200, suggest some yourself, such as 102, 103, or 108.

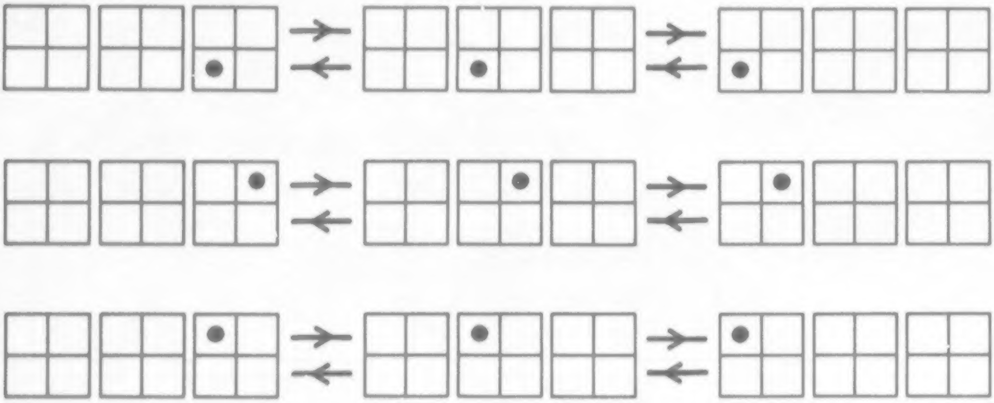
Continue this activity as long as the class remains interested.

Exercise 2

Remove all checkers from the Minicomputer. Put a checker on the 1-square and move this checker from the 1-square to the 10-square to the 100-square and vice versa; lead the class in saying, "one - - ten - - one hundred - - ten - - one" as you do this.



Continue this activity with the following configurations.



F 51

F51.2 Addition on the Minicomputer #2

CAPSULE LESSON SUMMARY

Present an addition problem in a story situation with a string picture and solve the problem on the Minicomputer. Make use of a backward play on the Minicomputer.

MATERIALS

Teacher: Minicomputer set; colored chalk

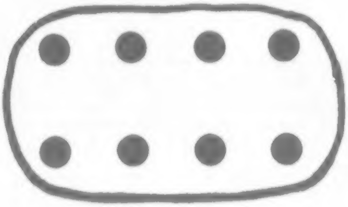
Student: None

DESCRIPTION OF LESSON

In telling the following story, substitute the name of one of your students.

T: Yesterday, Vicki was walking in the woods. Let's draw a picture to show the animals she saw on here walk.

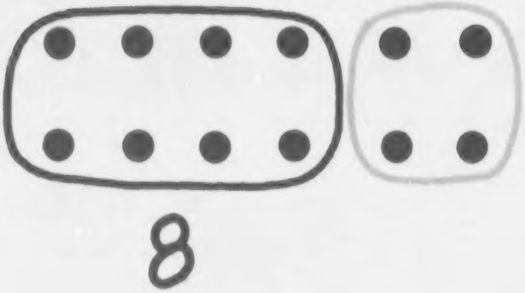
Draw this picture on the board.



T: In this red string are the squirrels Vicki saw.
How many squirrels?

S: Eight.

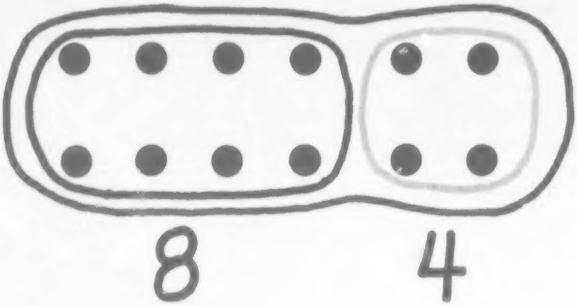
Write "8" under the picture and then add a yellow string and four dots.



T: In this yellow string are the chipmunks she saw. How many chipmunks did Vicki see?

S: Four.

Write "4" under the yellow string and then draw a blue string (as shown below) around both red and yellow strings.



T: How many animals did Vicki see all together?

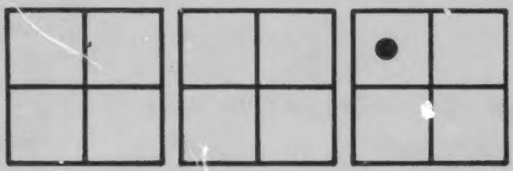
S: Twelve.

F 51

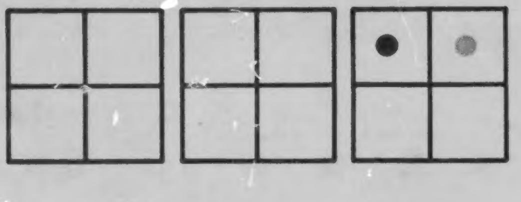
Ask a student to count the dots. Write this number story on the board and read it aloud.

$$8 + 4 = 12$$

T: Let's tell our story on the Minicomputer. Who would like to put on the Minicomputer the number of squirrels Vicki saw?



T: Who would like to put on the Minicomputer the number of chipmunks Vicki saw?



T: Here (point to the checker on the 8-square) we have the eight squirrels, and here (point to the checker on the 4-square) we have the four chipmunks. How many animals all together?

S: Twelve.

T: This is not how we usually put 12 on the Minicomputer. Who can suggest another way to put 12 on the Minicomputer?

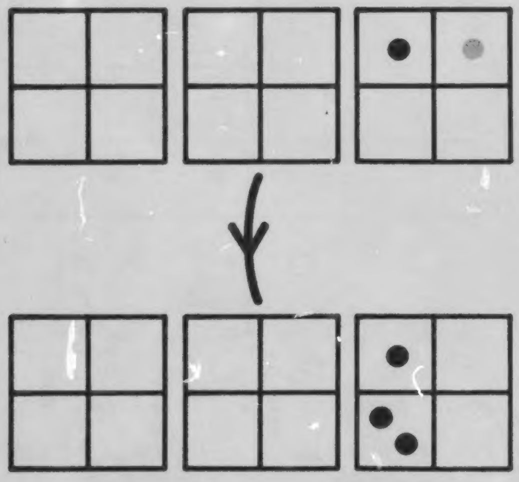
Let a student point to the squares (the 10-square and the 2-square).

T: Correct; we could have a checker here (point to the 10-square) and here (point to the 2-square). Which play would give us a checker here (on the 10-square)?

S: "8 + 2 = 10".

T: We have 8, (point to the checker on the 8-square), but we need 2 (point to the 2-square). Which play can we make to get checkers on this square?

Let the class discuss this problem. If after some time, no one has suggested the "4 = 2 + 2" play, suggest it yourself. Exchange the checker on the 4-square for two checkers on the 2-square. Emphasize that a backward play requires putting on another checker, demonstrate the play, and as you do, say "four is two plus two.



T: Now; who sees a play that can be made?

A student might suggest the "2 + 2 = 4" play; agree that this is a good play, but that it is not very useful. When someone suggests the "8 + 2 = 10" play,

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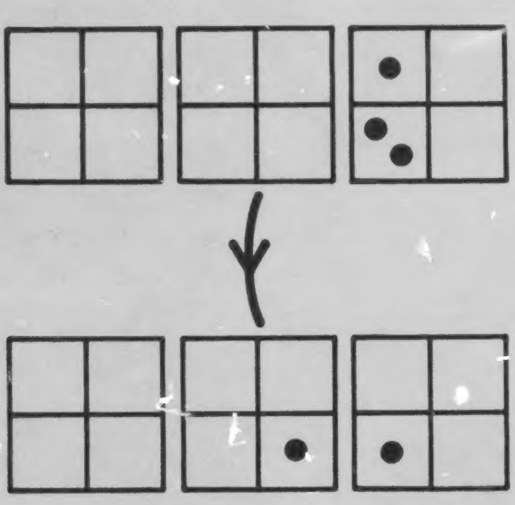
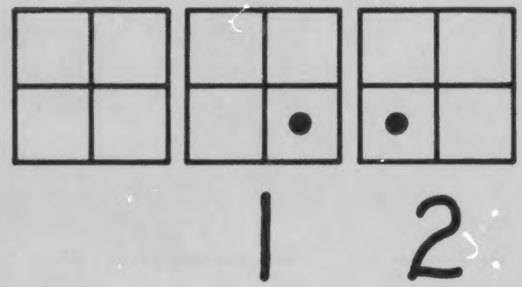
ask the student to make the play while you say "Eight plus two is ten".



Ask which number is on each Minicomputer board, and then write the numerals beneath the boards.



If the lesson has gone quickly, you could tell a new story involving "8 + 5 = 13", and then make the plays to arrive at the standard configuration.

F52.1 Detective Story

CAPSULE LESSON SUMMARY

Discover a secret number from clues involving counting by fives, the "is less than" relation, and configurations on the Minicomputer.

MATERIALS

Teacher: Minicomputer set; 0-109 Numeral Chart; colored chalk
Student: None

DESCRIPTION OF LESSON

Before the lesson begins write a large "10" on a slip of paper, folding it so that the numeral is hidden.

T: I wrote the name of a secret number on this paper. You are all going to be detectives and try to discover what my secret number is. What does a detective do?

Encourage class discussion, mentioning, among other things, that a detective searches for things and uses clues rather than just guessing what the secret number might be.

T: Listen carefully to this story and you can discover what the secret number is. If we start at 0 and count by fives, we will reach the secret number. Let's count by fives together.

As the class counts by fives, point to the appropriate numerals on the 0-109 numeral chart. Count as far as you feel is appropriate.

T: Let's record some of these numbers on the board. What was the first number we said?

S: 0.

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Write "0" on the board. Ask the students which number came next, and continue recording the numbers on the board, up to at least 40.

T: Are these all of the numbers we could reach when counting by fives?

S: No, we could go on and on.

Lead the discussion until many of the students realize that this list could go on and on. Draw three dots at the end of your list, and draw the students' attention to these dots.

T: These dots are for all the other numbers which we could reach if we we were counting by fives.

0, 5, 10, 15, 20, 25, 30, 35, 40, ...

T: The secret number is one of the numbers on our list.
Could the secret number be 30?

S: Yes.

T: Yes; 20 is on our list.
Could the secret number be 13?

S: No.

T: 13 is not on our list so 13 cannot be the secret number.
Could the secret number be 85?

S: Yes.

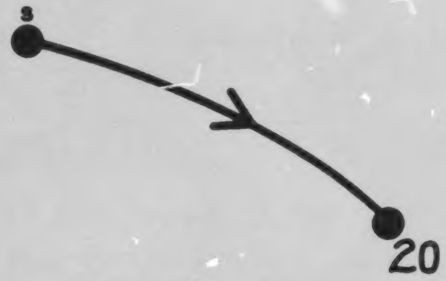
Point to the three dots.

T: We didn't write 85 on the board but it is on our list. If we count by fives we would reach 85 right after 80. 85 could be the secret number.

Do not expect all of your students to understand the three dots.

T: We know many numbers which could be the secret number; we need more information to be sure. I will give you another clue.

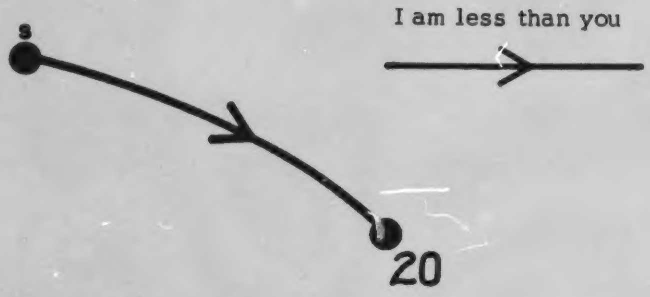
Draw this picture on the board.



Point to the dot labeled "s".

T: This is the secret number. It is speaking to 20, saying "I am less than you."

Write the key arrow near the arrow picture.



T: Which numbers could the secret number be?

Allow the class to discuss this situation. The following is a sample dialogue.

S: It could be 10.

T: Let's check whether the secret number could be 10. Can 10 say, "I am less than you", to 20? (Yes) Is 10 one of the numbers we would reach if we counted by fives starting at 0? (Yes) So, 10 could be the secret number.

Circle "10" in your list of numbers.

S: 7 is less than 20.

T: Yes, but is 7 one of the numbers we would reach if we counted by fives? (No) Remember, one of our clues is that we would reach the secret number if we started at 0 and counted by fives. 7 cannot be the secret number.

S: 20 is in our list.

Point to the dot for the secret number (labeled "s") in the arrow picture.

T: Could 20 be the secret number? Is 20 less than 20?

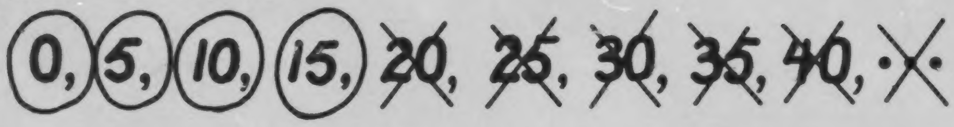
S: No.

Cross "20" off your list. Continue until all the numbers in your original list are either circled or eliminated. Point to the three dots at the end of the list.

T: Could any of the numbers which are on the list but not on the board be the secret number?

S: No, those numbers are all more than 20 .

Cross off the three dots.


0, 5, 10, 15, 20, 25, 30, 35, 40, ...

T: Now we know that the secret number is either 0 , 5 , 10 , or 15 .

Erase everything which has been crossed off. Display two Minicomputer boards.

T: I'll give you one more clue. When you know the secret number, whisper it to me.
The secret number can be written on the Minicomputer with only one checker. What is the secret number?

Allow many of the students to whisper their answers to you, but do not yet reveal the correct one (10).

T: Who could put the secret number on the Minicomputer with only one checker?

After a volunteer has put 10 on the Minicomputer, ask if anyone can put 0, 5, or 15 on the Minicomputer using just one checker.

Finally, unfold the slip of paper on which you had earlier written the name of the secret number, and reveal it to the class.

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F52.2 Composition of Functions

CAPSULE LESSON SUMMARY

Find the largest and smallest numbers in a +1 arrow picture and then label all the dots. Draw all the possible +2 arrows in the same picture.

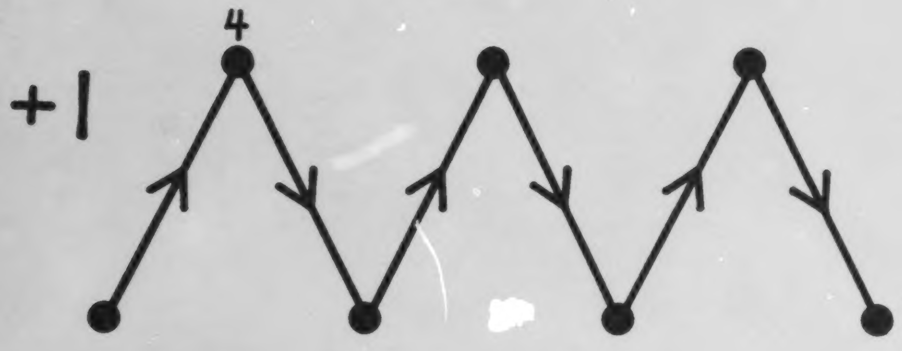
MATERIALS

Teacher: Colored chalk

Student: Worksheet F52.2* and **; red pencil

DESCRIPTION OF LESSON

On the board, draw this arrow picture.



T: Point to the smallest number in this arrow picture.
Tell me, with whispers, which is the smallest number.

S: 3.

T: Point to the largest number in this arrow picture.
Tell me, with whispers, which is the largest number.

S: 9.

T: What are the blue arrows for? (+1)

Point to " 4 " and then trace the blue arrow which starts at 4 .

T: 4 plus 1 is?

S: 5 .

Write " 5 " near the appropriate dot. Point to the next dot.

T: What number is this? How do you know?

S: 6 , because 5 + 1 = 6 .

Ask a volunteer to label this dot and continue in this manner until the dot for 9 has been labeled; then, point to the left most dot.

T: Who can tell us what number this is?

When a correct answer is given, allow the student to label the dot. Ask how one knows this is correct. Help the student to trace the arrow and say " 3 + 1 = 4 ".

Near the arrow picture, write " + 2 " in red.

T: Can we draw any red +2 arrows in this arrow picture?

Let students make suggestions by tracing a +2 arrow on the board. Guide their suggestions; no more dots should be added to the drawing. If no one suggests a correct +2 arrow, point to " 3 " and ask:

T: What number is 3 + 2 ?

S: 5 .

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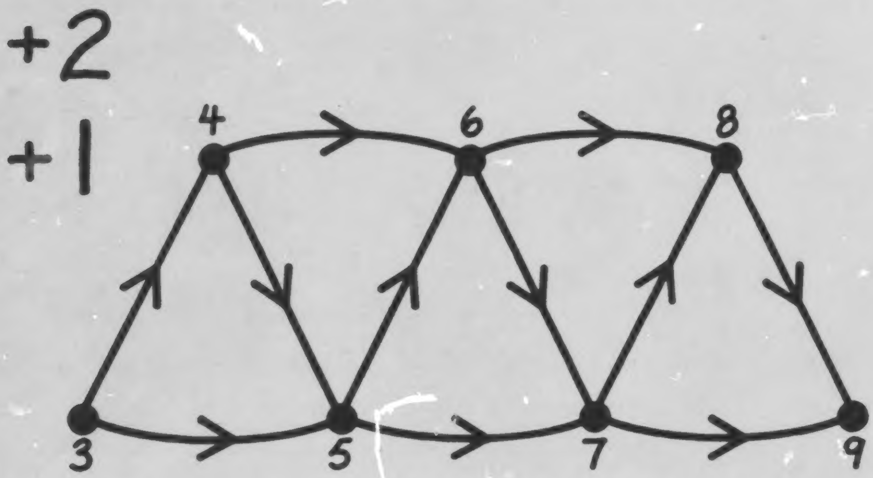
Draw a red arrow from 3 to 5 as you say, "3 + 2 = 5."

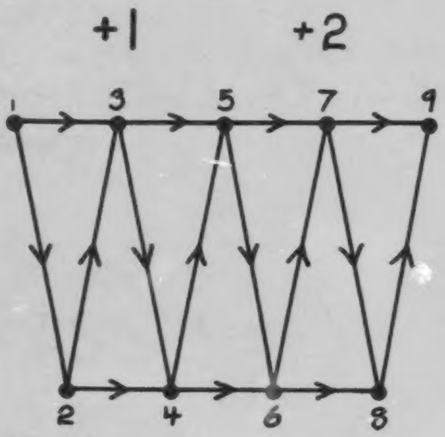
Continue asking the students to trace +2 arrows on the board until the arrow picture is complete. When an arrow is correctly traced, draw it yourself in red. Occasionally, ask a student to explain why a +2 arrow may be drawn from one number to another.



Distribute Worksheets F52.2*, and **. Explain to the students that they are to label the dots first. When they have labeled the dots, they should draw all of the +2 arrows in red.

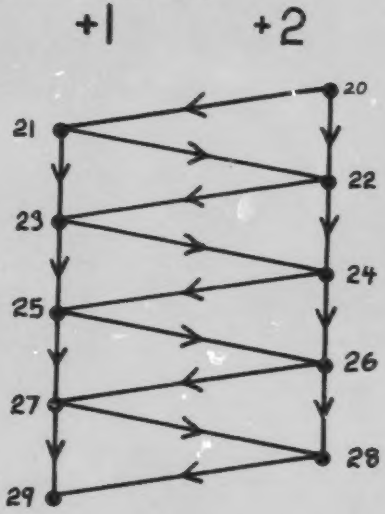
Name ____________________ F52.2 *

Label the dots. Draw all the +2 arrows.


+1
+2
1
3
5
7
9
2
4
6
8

Name ____________________ F52.2 **

Label the dots. Draw all the +2 arrows.


+1
+2
20
21
22
23
24
25
26
27
28
29

F 53

F53 Individual Minicomputer Activity #1

CAPSULE LESSON SUMMARY

Put numbers on individual Minicomputers and find different configurations for one number.

MATERIALS

Teacher: Minicomputer set

Student: Minicomputer set[*]; container or envelope (for checkers)

DESCRIPTION OF LESSON

Distribute student Minicomputer sets; only one sheet with individual Minicomputer boards is needed. Instruct the students to carefully punch out only the colored checkers; they should not punch out the white checkers with black markings ((^)).

Walk around the room to be sure that all of the Minicomputers are positioned correctly. Since you will need the white checkers later in the year, you may want to pick up these checkers which have not been punched out and put them away for later use.

The students may be boisterous and excited over having their own Minicomputers! Remind them to be careful with their checkers so as not to lose some of them. Allow several minutes for the students to freely make designs with the checkers, put numbers on their Minicomputers, and so on.

Distribute containers or envelopes and ask the students to put all but two of their checkers in the envelopes.

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[*] A student's Minicomputer set consists of two individual Minicomputer sheets (2 Minicomputer boards per sheet), plus one sheet of checkers. Only one Minicomputer sheet per student is needed for this particular lesson.

T: I will ask you to put some numbers on your Minicomputer. For some of these you will need two checkers; others can be put on the Minicomputer with just one checker.

Ask the students to put the following numbers on their Minicomputers.

4, 40, 6, 60, 2, 80, 9, 50, 12, 28

Move about the room as you ask for the numbers, and give help as needed. If many students have trouble with a particular number, ask a volunteer to put the number on the demonstration Minicomputer at the board.

T: Now you may use as many checkers as you wish; put 16 on your Minicomputer.

Move about the room and, as you notice a student with a different way to put 16 on the Minicomputer, ask that student to put it on the demonstration Minicomputer.

You may want to have the students count their checkers as they put them away. Each should have 36 checkers, 12 of each color.

F 54

F54 The Numbers Speak #4

CAPSULE LESSON SUMMARY

Review the "is less than" and "is more than" relations. Label the dots in an arrow picture with arrows for "is less than". Draw all the "is more than" arrows in the same picture and note that an "is more than" arrow is the return arrow for an "is less than" arrow.

MATERIALS

Teacher: Colored chalk

Student: Colored pencils ; unlined paper

DESCRIPTION OF LESSON

Exercise 1

This activity should be conducted at a brisk pace. Point to the various students to complete each sentence. If students are suggesting only consecutive numbers, you should complete a sentence yourself with a non-consecutive number and continue to another sentence. An example dialogue follows.

T:	3	is less than . . .	S:	5.
	5	is less than . . .		9.
	9	is less than . . .		40.
	40	is less than . . .		100.
	100	is less than . . .		200.

When you are given a number which is very large and would make it difficult to continue, reverse the relation.

T:	1,000,000 is more than . . .	S:	1,000.
	1,000 is more than . . .		500.
	500 is more than . . .		150.
	100 is more than . . .		99.
	99 is more than . . .		90.
	90 is more than . . .		1.
	1 is more than . . .		0.

Exercise 2

Draw four dots spread out across the board, leaving some room at the top of the board to draw key arrows.

Tell the students that each dot is a number and that they may choose which numbers they would like to be in the picture. Point to a dot.

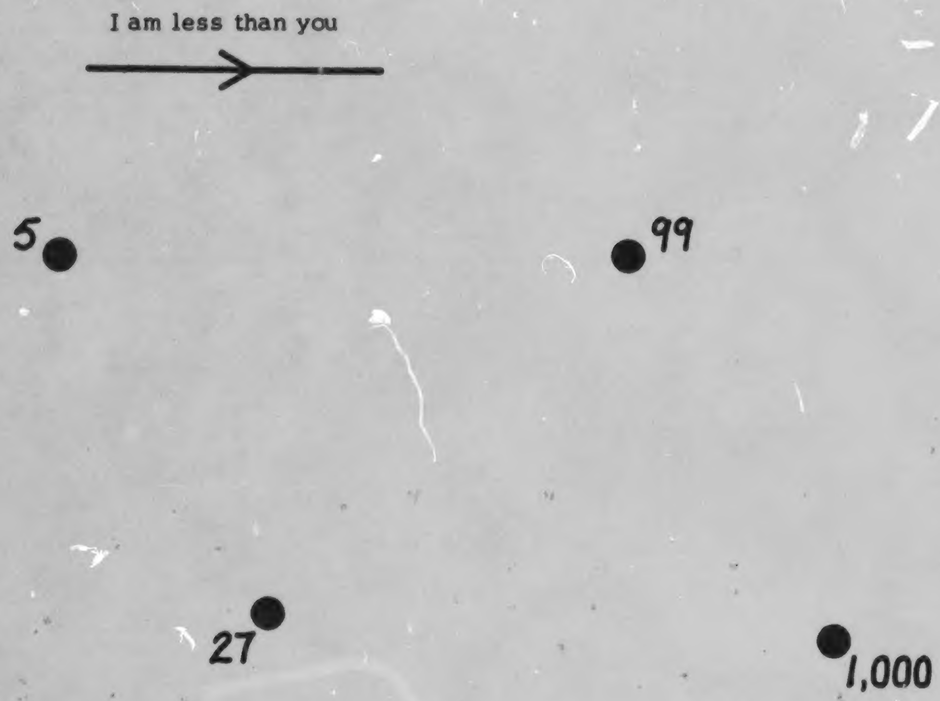
T: Which number would you like this dot to be?

Continue in this manner until all four dots have been labeled. If students suggest that two dots be for the same number, say, "This dot is 10; what could this dot be?"

NOTE: By convention, there is only one dot for each number; therefore, two dots cannot represent the same number.

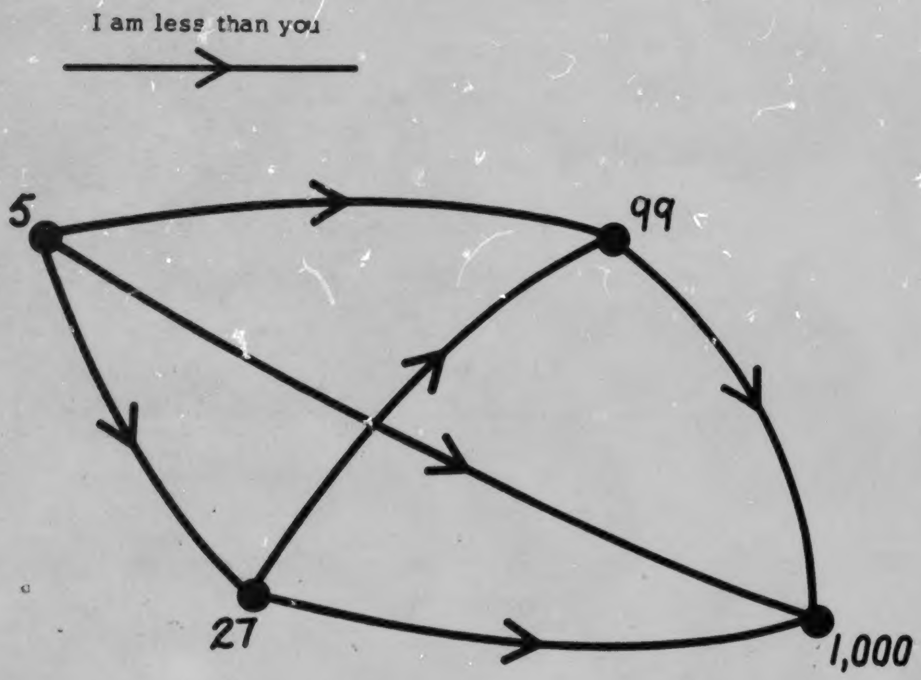
Above the labeled dots, draw the key arrow. Your picture might now look like the one shown on the next page.

F 54



T: These numbers are speaking to each other; they are each saying, "I am less than you." Where could we draw a red arrow?

Invite various students, one at a time, to trace arrows. When an arrow has been correctly traced, draw it yourself and say, for example, "5 is less than 27." Continue in this manner until six red arrows have been drawn, as shown (for this example) on the next page.



T: Which number speaks the most?

S: 5.

T: To which numbers is 5 speaking?

S: 99, 27, and 1,000.

One-by-one, trace the arrows which end at 1,000. Emphasize that the ending number for each of these arrows is 1,000.

T: What could 1,000 say to one of the other numbers?

S: "I am more than you."

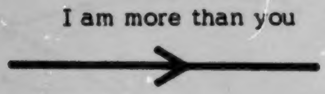
F 54

T: To which numbers could 1,000 say, "I am more than you?"

S: 5, 27, and 99.

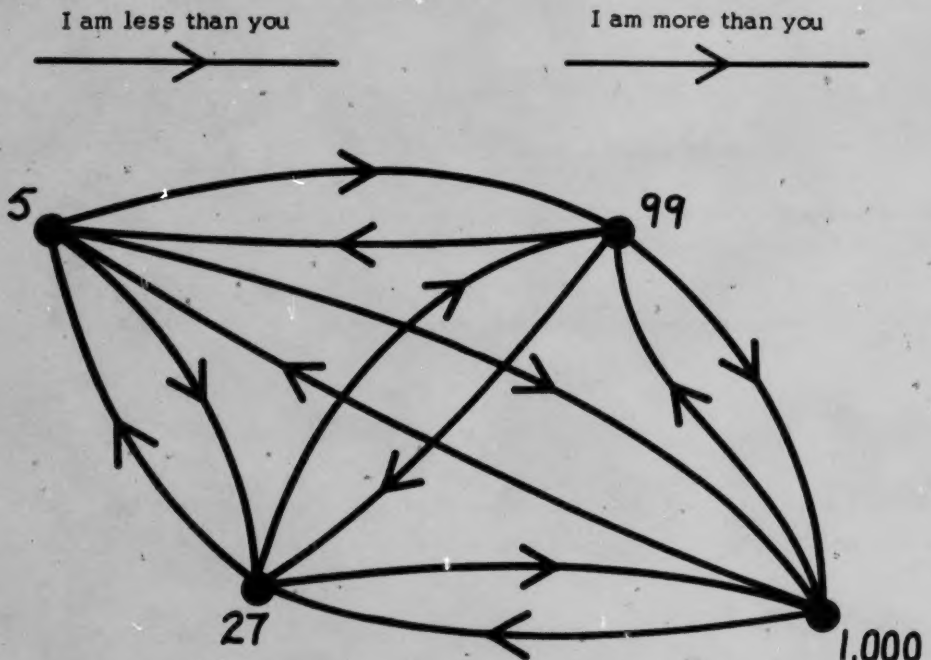
T: Other numbers could say to each other, "I am more than you." We can show them speaking with blue arrows.

Draw a new key arrow above your picture.



T: Where could we draw a blue arrow?

Ask volunteers to trace blue arrows in the picture, and then draw the arrows yourself as you say, for example "27 is more than 5". Sometimes you might ask the student to speak for the number. Try to draw the arrow picture as clearly as possible. Continue in this manner until six blue arrows have been drawn. Be prepared to suggest any missing blue arrows, if necessary.



Exercise 3

Erase all except the key arrows from the board.

Distribute unlined paper and colored pencils. Ask the students to tell the same sort of story with three numbers of their own choosing. They should show the three numbers speaking to each other with red arrows for "I am less than you" and blue arrows for "I am more than you". Encourage students to draw the key arrows on their paper.

Students who finish quickly could go on to tell a similar story with five numbers.

F 55

F55 Two Sets #2

CAPSULE LESSON SUMMARY

Use string pictures to classify the students in the classroom according to some well-defined characteristics.

MATERIALS

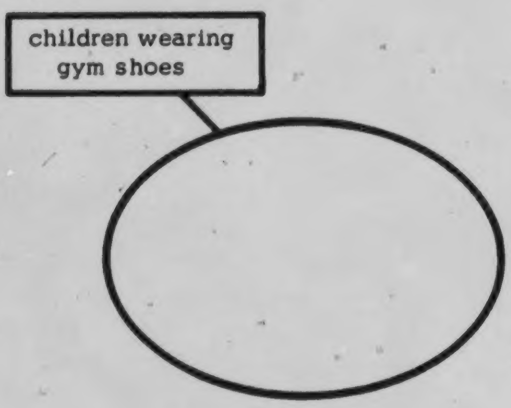
Teacher: Colored chalk

Student: Colored pens, pencils or crayons; unlined paper

DESCRIPTION OF LESSON

NOTE: The string labels used in this lesson - - "children wearing gym shoes" and "boys" - - may not be appropriate for your class. Ideally there should be several children who are in the first category but not the second; several in the second but not in the first; several who are in both; and several who are in neither category. If this is not the case for your class, choose two other string labels so that the students will be distributed among the four categories. Be sure that the labels you choose are such that there will be no debate over whether a particular student fits into that category. "Children who are tall", for example, would be a poor choice since a child may seem tall to some people but not to others.

Draw this picture on the board.



T: This red string is for all children wearing gym shoes. Can you draw a dot for yourself in this picture?

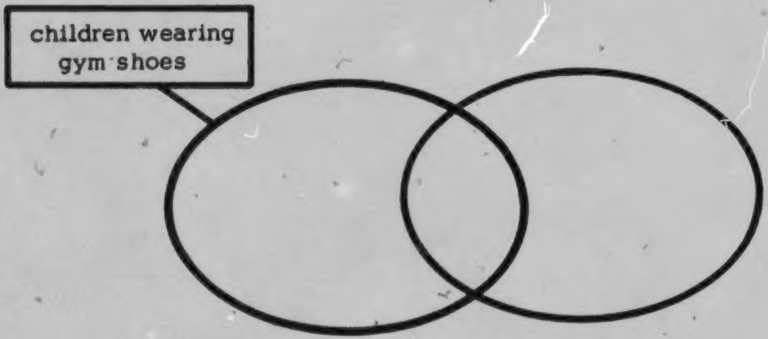
Let two or three students who are wearing gym shoes draw dots for themselves (inside the string); and some who are not wearing gym shoes draw their dots (outside the string).

T: Who can draw a dot for my desk?

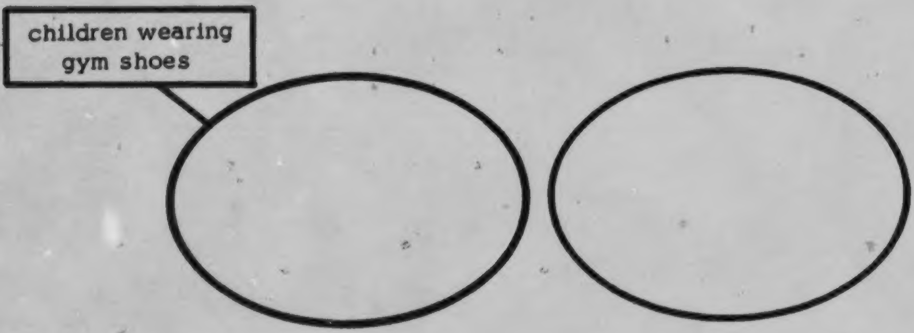
Of course, this dot should be drawn outside of the string. Erase the dots before continuing.

T: Who would like to draw a blue string for all the boys in the class?

The blue string should be drawn so that the two strings overlap; most students will realize this.

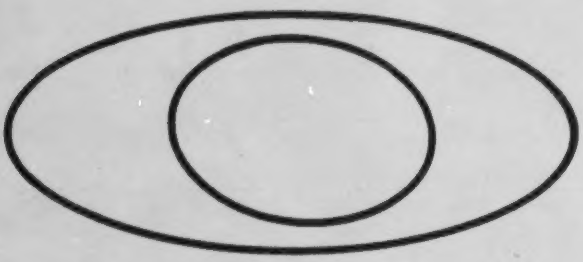


If, instead, a student draws a non-overlapping blue string . . .



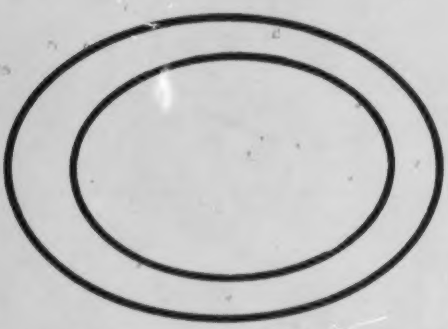
. . . choose a boy wearing gym shoes, and ask him to draw his dot. The class should observe that this is not possible and suggest that the blue string should be redrawn. Some students may suggest drawing two dots, one in each string; explain to them that there should be only one dot for the boy.

If a student draws the blue string inside the red string . . .



. . . ask a boy not wearing gym shoes to draw his dot; and discuss the difficulty.

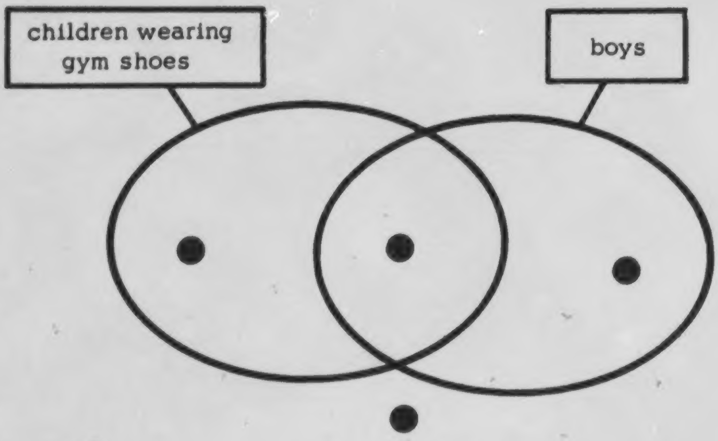
Similarly, if a student draws the blue string enclosing the red string . . .



. . . ask a girl wearing gym shoes to draw her dot and discuss the difficulty.

When the blue string has been drawn correctly, label it "boys", and ask students to draw dots for themselves. Continue in this manner until two or three dots have been drawn in each region. Do not forget the region outside of both strings; you could ask that dots be drawn for such things as: a girl not wearing gym shoes; a student's pet dog; the classroom door; and so on.

Erase all but one of the dots in each region.



Point to the dots one at a time saying each time:

T: If this dot could be for you, raise your hand.

After you have pointed to each of the dots, ask:

T: Who did not raise their hands?

If some students believe that none of the dots could be for them, ask other students to help locate a dot for each of these students.

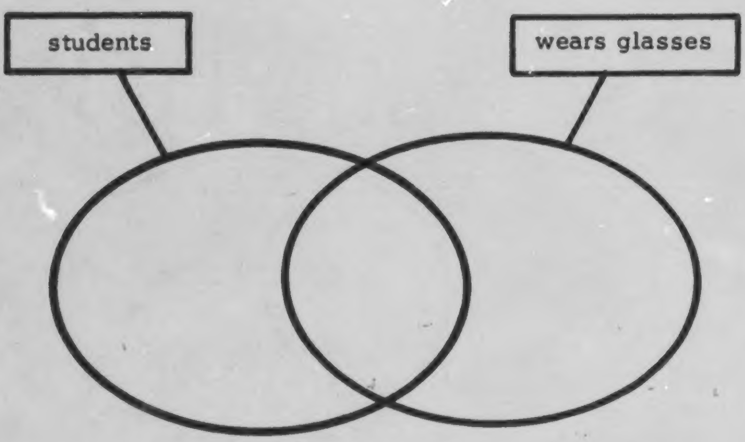
T: So, there is a dot that could be for each of you. Could anyone have more than one dot?

F 55

If a student claims to have more than one dot, let the class discuss this and discover which dot is actually correct.

T: It appears that no one can have more than one dot.

Distribure unlined paper. Erase the string labels and relabel them as in this picture.



T: The red string is for all students and and the blue string is for people who wear glasses. Copy this picture on your papers ; draw a dot for yourself and a dot for each person in your family.

Those who finish this activity quickly should label the dots, and then extend the picture to include aunts, uncles, cousins, or friends.

F56.1 Minicomputer Introduction #8

CAPSULE LESSON SUMMARY

Count by tens from 10 to 90 and back from 90 to 10. Put the multiples of 10 successively on the Minicomputer and review standard plays on the tens' board.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

Exercise 1

T: How many students do we need to show ten fingers?

S: One.

T: To show 20 fingers?

S: Two.

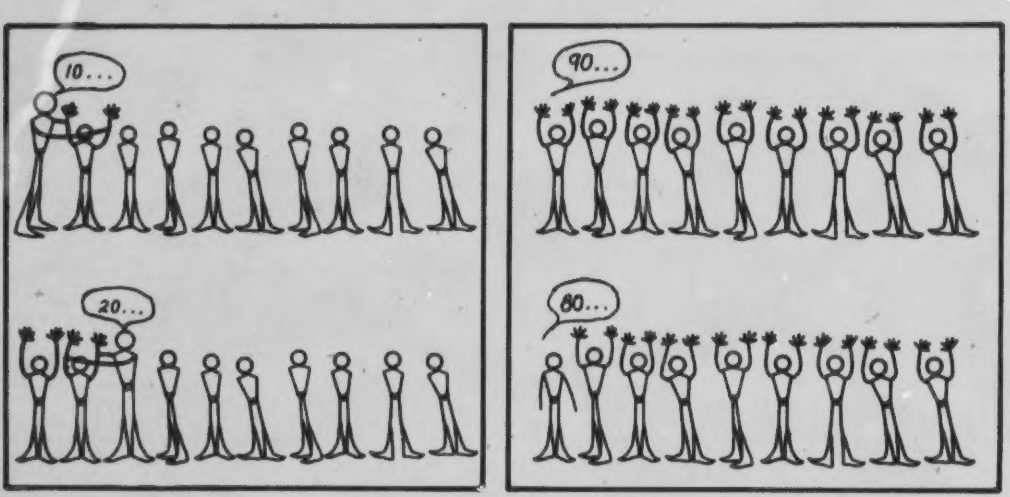
T: 30 fingers?

S: Three.

T: 90 fingers?

S: Nine.

Choose nine students to come up to the front of the class. Ask the rest of the class to count with you by tens as each of the nine students, in turn, holds up ten fingers. Move behind the students, holding up their hands and counting by tens up to 90. Then, have the class count backwards from 90 as the nine students, in turn, lower hands.



Exercise 2

Display three Minicomputer boards.

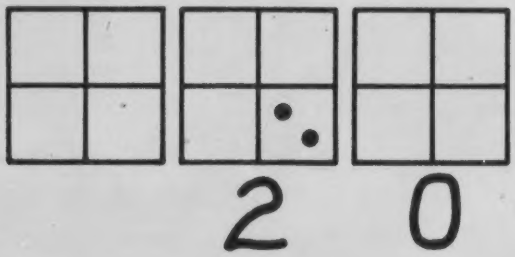
T: Who can put 10 on the Minicomputer with one checker?

Write "10" below the Minicomputer, and put another checker on the 10-square.

T: What number is on the Minicomputer now?

S: 20.

Erase the "10" and write "20" below the Minicomputer.



T: Can we make a play? (Yes)

Ask a student to make the "10 + 10 = 20" play. Then, put another checker on the 10-square.

T: What number is on the Minicomputer now?

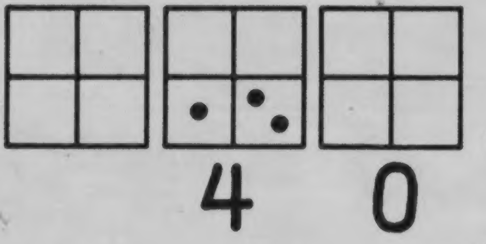
S: 30.

Erase the "20" and write "30" below the Minicomputer. Put another checker on the 10-square.

T: What number is on the Minicomputer now?

S: 40.

Erase "30" and write "40" below the Minicomputer.



T: Can we make a play?

Ask students to make the "10 + 10 = 20" and "20 + 20 = 40" plays. Continue in this way until 90 is reached.

Starting at 90, count backward by tens until 10 is reached. As the class says each number, put it on the Minicomputer (do not demonstrate the various plays). Then ask the class to count forward from 10 to 90 once again, as you put each number on the Minicomputer.

F 56

F56.2 Addition Problem #1

CAPSULE LESSON SUMMARY

Present an addition problem in a story situation and solve the problem on the Minicomputer. Make plays so that the number is easier to read.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

This is the first of several activities for addition practice using two Minicomputer boards. When you tell a brief story to introduce the addition problem, use names of students in your class, if you wish; the story below is only an example. You may also prefer to create your own story situation, especially if you know a subject which would be more interesting to your class.

T: Yesterday, John went to the bakery with his mother. What can a person buy at a bakery?

Allow time for a brief discussion here.

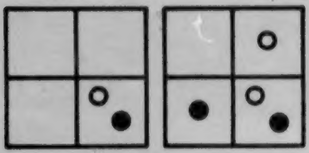
T: At the bakery, John was allowed to pick out something for himself, and something to take home to his little sister.

At this point, you could ask the student (John) to choose two items. If he has difficulty doing this, offer some suggestions. Use his choices in telling the rest of the story.

T: John picked an apple turnover for himself and a blueberry doughnut for his sister. The turnover cost 15¢ and the doughnut cost 13¢. How can we find out how much John spent all together?

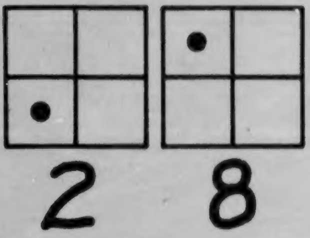
Allow time for a brief discussion of this problem, during which someone should suggest adding the two amounts on the Minicomputer. Accept some guesses and and write these on the board.

Write the calculation on the chalkboard and ask two students to put the two numbers on the Minicomputer, using checkers of two different colors.



$15 + 13 =$ or $\begin{array}{r} 15 \\ +13 \\ \hline \end{array}$

Then, invite students to make plays until you arrive at the standard configuration.



$15 + 13 = 28$ or $\begin{array}{r} 15 \\ +13 \\ \hline 28 \end{array}$

Call the students' attention to the list of their various guesses and recognize a correct guess or the best guess.

NOTE: It is not necessary to write the calculation both ways during the lesson. You should, however, vary the format so that the students will be familiar with both the horizontal and vertical formats.

F 57

F57.1 Class Plan

CAPSULE LESSON SUMMARY

Draw an array of dots for the students in the classroom and use relative position of the dots to locate various students. Draw arrows and loops for the relation "I have the same first name as you".

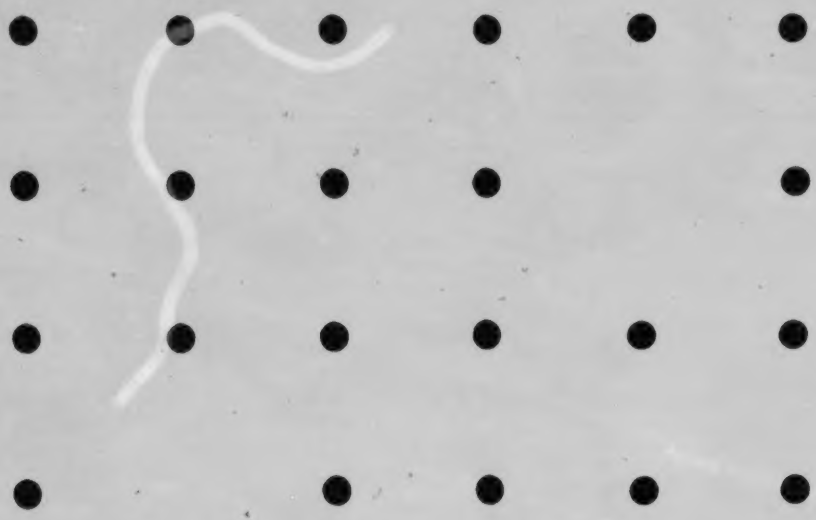
MATERIALS

Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

Make it obvious to the students that you are studying the class arrangement. Then draw a diagram on the board of the students as they are sitting in the class. For example,



Arrange your diagram so that the front of the room is at the top of the picture.

T: What do you think about this picture?

If no one refers to its being a picture of the class, remind the students that you were examining the class very carefully before you drew the picture. Look directly at one student and point to the student's dot.

T: This dot is for one of you. Who do you think it is?

Continue in this way, offering stronger hints if necessary, until someone suggests that the dots are for the students in the classroom. When this has been established, continue.

T: Can you find your dot?

Invite several students to point out their dots, each time asking the class to check that they are correct. Choose students from quite different places in the room.

T: This time, I'll point to a dot. If it is your dot, raise your hand.

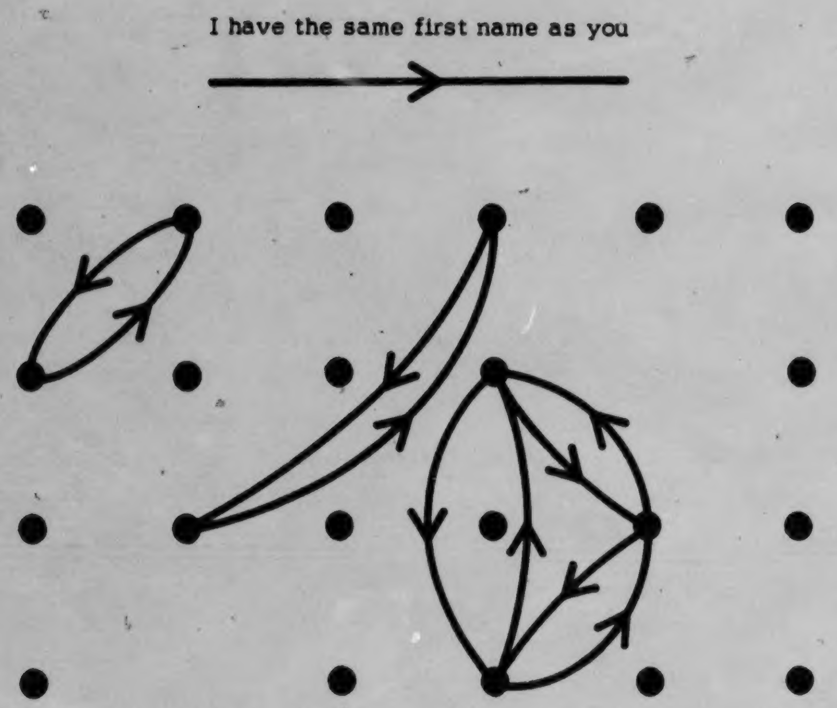
Select a variety of dots in the picture until you believe the students all know where they are in the picture.

T: Now, we are going to play a game called "I Have the Same First Name As You." Who can point to whom in this game?

We expect that at least two children in your class share the same first name and may point to each other (disregard any differences in spelling). If this is not the case, the parts of the lesson involving loops may still be conducted; or, you may wish to use another relation such as "I have the same last name as you" or "I live on the same street as you". In any event, add the appropriate key arrow to your drawing at the board.

Ask those students who can point to each other to come to the board, find their dots, and trace the appropriate arrows. Then, draw the arrows yourself. Repeat the process for other students who can point to each other. Your picture might resemble the one on the following page.

F 57



If students do not suggest drawing loops, call on someone who has not yet pointed in this game.

T: Bill (or whomever you have chosen), there is someone in the class who has the same first name as you do. Who is it?

Ultimately, someone will realize that Bill has the same first name as himself.

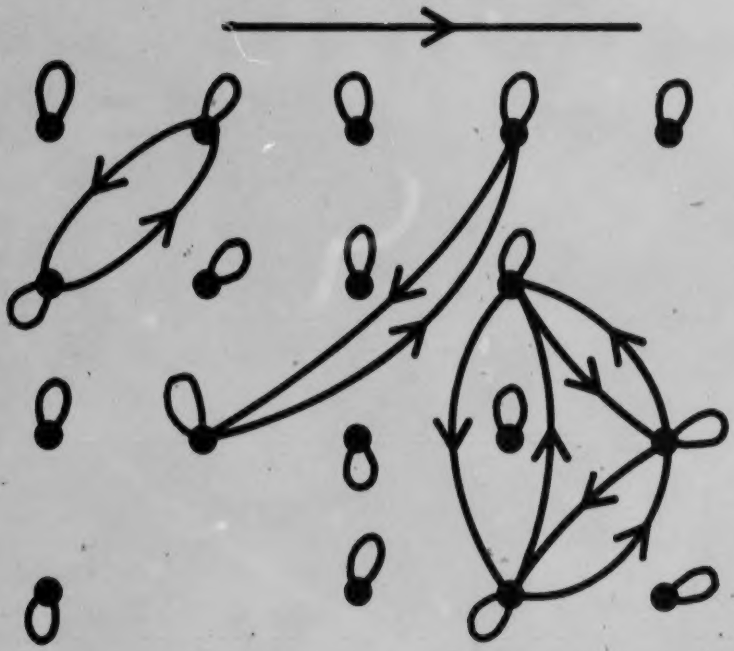
T: Bill can point to . . .

S: Himself.

T: Who can show us how to draw that?

Someone should come to the board and trace a loop. Draw it and invite several other students to trace loops. Then complete the picture by drawing a loop at every dot.

I have the same first name as you



F 57

F57.2 A-Block Table

CAPSULE LESSON SUMMARY

Place A-Block pieces in a table according to their color and shape characteristics.

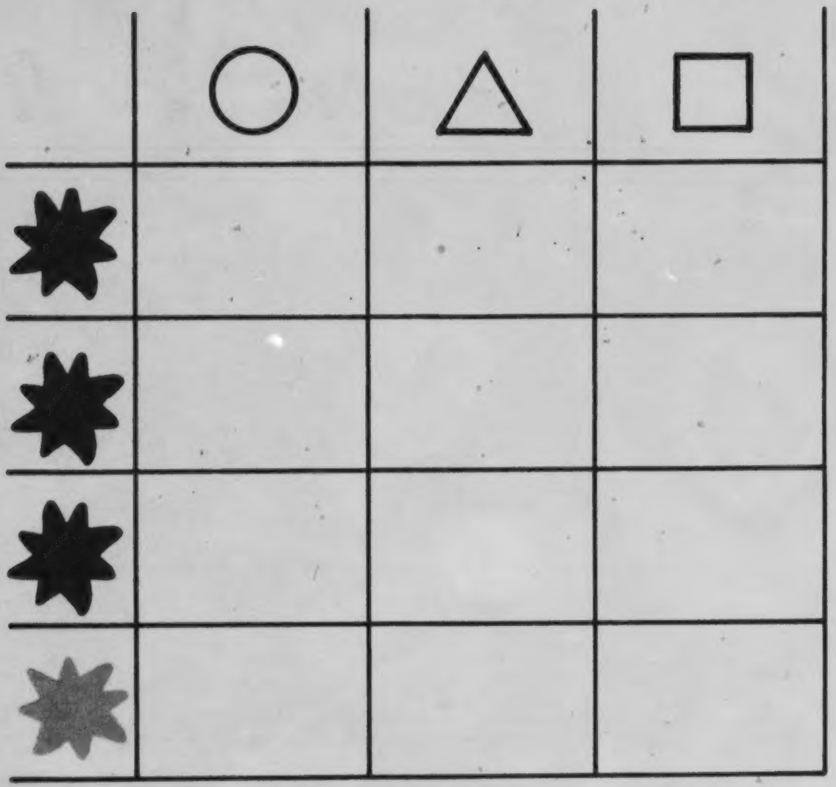
MATERIALS

Teacher: One set of A-Blocks; colored chalk; loops of masking tape

Student: One set of A-Blocks; Worksheet F57.2

DESCRIPTION OF LESSON

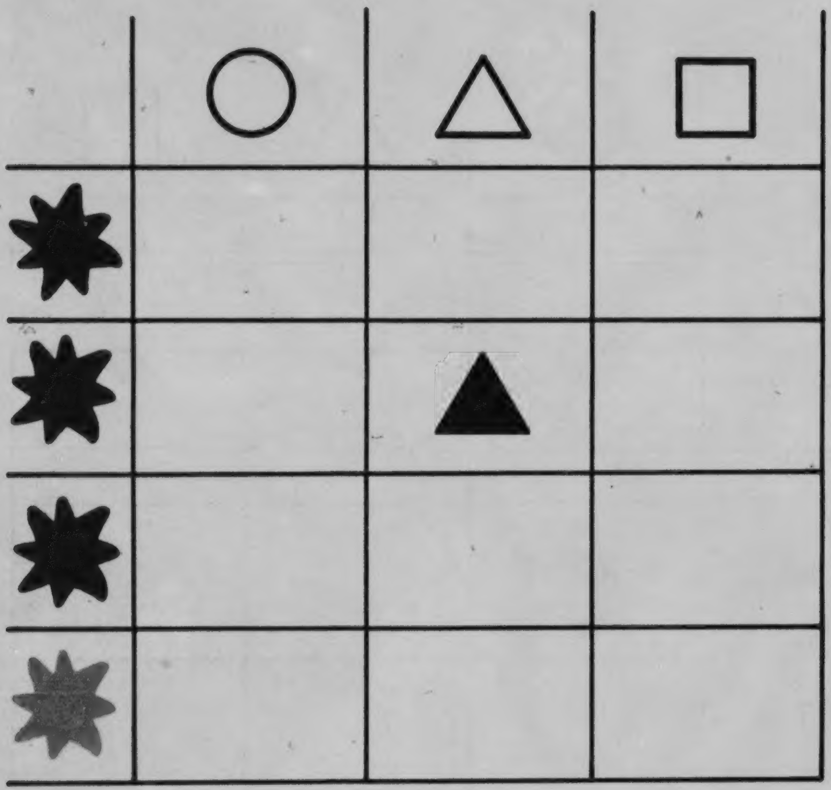
Draw the following table on the board (the colored patches should be drawn without any particular shape to them). The spaces in the table should be large enough for A-block pieces.



Hold up a red triangle for the students' inspection.

T (pointing to the 12 spaces in the table): In which of these spaces should I put this piece?

Accept suggestions until someone indicates the position shown below and place the piece on the board.



Point to the red patch with your left index finger and the triangle column heading with your right index finger, as you say:

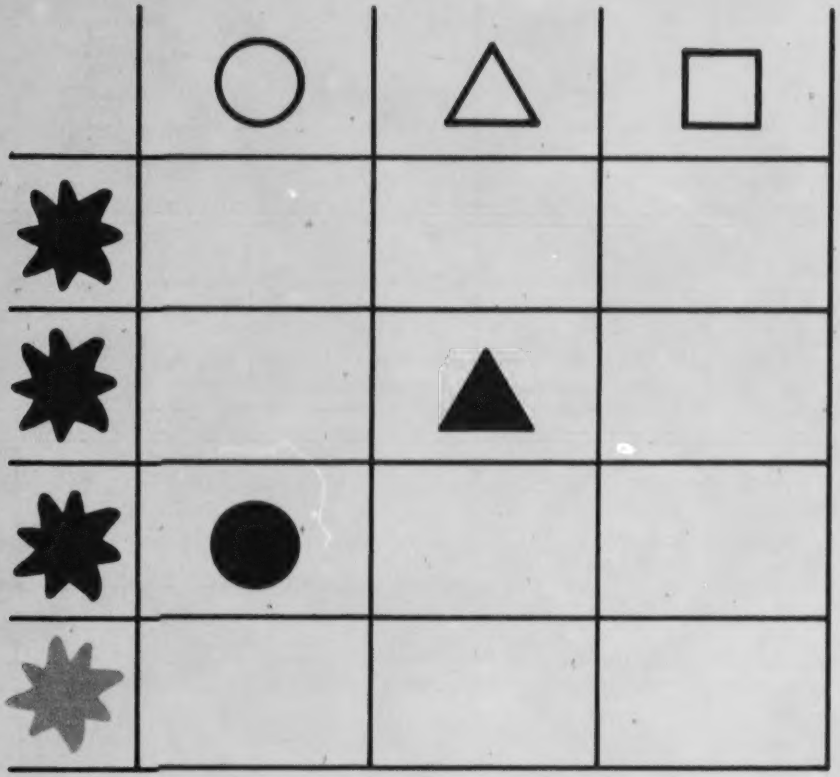
T: It's red and it's a triangle . . .

F 57

Run your left finger horizontally to the right, and your right finger downward, until your fingers meet at the red triangle.

T: . . . so we put it here. Who can find a piece to put here (point to the space for the green circle)?

Ask a student to select one of the A-Blocks; if the student is correct, put the piece in the table in its proper place.



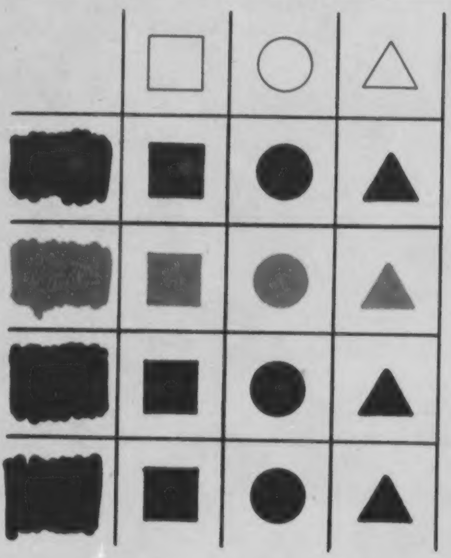
If an incorrect piece is selected, ask where it should be placed, place it there, and repeat the original question.

Alternate the two methods (selecting a piece and asking where it belongs, or pointing to a space and asking what could go there) until six or eight pieces have been placed on the chalkboard.

Distribute Worksheet F57.2 and A-Blocks. Explain that the students are to find an A-Block to put in each space on the worksheet; provide help as it is needed.

Students who finish quickly, could be asked to place the A-Blocks on the worksheet so that all of the rules are broken; that is, so that none of the pieces in the "△" column are triangles, none of the pieces in the "✸" row are red, and so on.

Name ______________ **F 57.2**



F58.1 Minicomputer Introduction #9

CAPSULE LESSON SUMMARY

Count forward and backward by tens, going from 0 to 100 and from 100 to 0. Put multiples of 10 on the Minicomputer and review standard plays on the tens' board.

MATERIALS

Teacher: Minicomputer set; 0 - 109 Numeral Chart
Student: None

DESCRIPTION OF LESSON

Quickly review, in random order, the numbers which can be put on the ones' or tens' board of the Minicomputer with a single checker; for example, 40, 8, 10, 80, 1, 4, 20, and 2. Ask the class to read the numbers as you move the checker.

Move to the 0 - 109 numeral chart, point to the left column (beginning with "0"), and ask the students to read downward, saying the numbers aloud. Next ask them to close their eyes and count by tens. You may wish to repeat this once or twice. Now point to "100" and ask the class to read aloud, going up the column. Finally, ask the students to close their eyes and count backward by tens.

Return to the Minicomputer and put three checkers on the 10-square.

T: What number is on the Minicomputer?

S: 30.

Point out that there are three tens and count: 10, 20, 30.

T: If I were to put two more checkers on this same square, what number would it be?

S: 50.

Put two additional checkers on the 10-square.

T: If I were to put two more checkers on this square, what number would it be?

S: 70.

Put two more checkers on the 10-square.

T: And one more . . ?

S: 80.

Add this last checker.

T: Eight checkers on the 10-square is one way to put 80 on the Minicomputer.

With the class, count by tens from 10 to 80, and then write "80" under the Minicomputer.

T: Who remembers how to make plays on the Minicomputer?

Invite students to make plays until there is just one checker on the 80-square. If a student has difficulty, cover all of the checkers except two which can be used to make a play. Encourage using both hands to make a play and saying the play aloud.

At several points during these plays, emphasize that the number on the Minicomputer is always 80, but is being shown in a different way. When the standard configuration for 80 is on the Minicomputer, continue.

T: How many students do we need to show 80 fingers?

S: Eight.

Choose eight students to come up to the front of the room. Move behind the students and hold up their hands in turn. Ask the class to count by tens from 10 to 80 as you do this.

Separate the eight students into two groups of four.

T (pointing to one of the two groups): How many fingers in this group?

S: 40.

T: How many fingers in the other group?

S: 40.

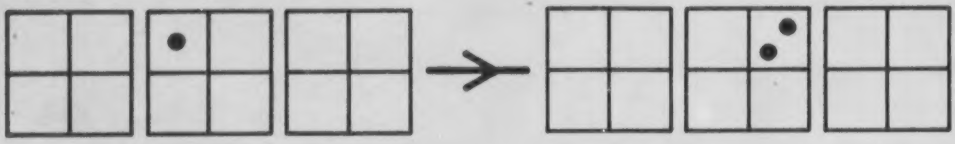
T: 40 fingers and 40 fingers is 80 fingers.

As the students return to their places; continue.

T: Who can make a backward play on the Minicomputer to get 80 with two checkers?

If necessary, help a student to use both hands and say:

S: 80 is the same as 40 + 40.



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You may wish to stop at this point, or continue to make backward plays (until there are eight checkers on the 10 - square), depending upon the interest of the class.

F58.2 Addition Problem #2

CAPSULE LESSON SUMMARY

Present an addition problem in a story situation, estimate the solution, and solve the problem on the Minicomputer. Use plays to make the number easier to read.

MATERIALS

Teacher:	Minicomputer set
Student:	None

DESCRIPTION OF LESSON

Use the following story, or make up one of your own. Use the name of a student in the class who has recently had a birthday.

T: Suppose Jane got an aquarium for her birthday. Who can tell me what an aquarium is?

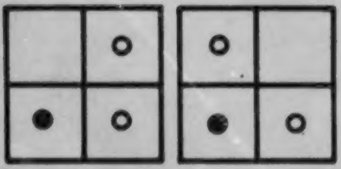
Allow some discussion (some of the students may even own an aquarium).

T: This aquarium was empty and Jane received some money to buy some fish for it. She went to the pet store to pick out two fish. There were cardinal fish, zebra fish, glow light fish, guppies and many others.

Discuss the different fish and how they might look.

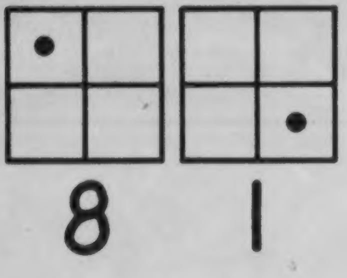
T: Jane had a difficult time deciding which fish to buy. She finally picked out a zebra fish and a guppy. The zebra fish cost 59¢ and the guppy cost 22¢. How can we find out how much money Jane spent all together?

The students will probably tell you to add the amounts, using the Minicomputer. Ask a student to write the calculation on the board and put the numbers on the Minicomputer, using checkers of different colors for each of the two numbers.



$59 + 22 =$ or $\begin{array}{r} 59 \\ +22 \\ \hline \end{array}$

Encourage students to estimate the answer, and write several of their estimates on the board. Let students make plays until the standard configuration for the answer (81) is on the Minicomputer. Ask students whose estimates were closest how they obtained their estimates, and then complete the calculation on the board.



$59 + 22 = 81$ or $\begin{array}{r} 59 \\ +22 \\ \hline 81 \end{array}$

If time permits, do a few more calculations, such as "60 + 22 =", "59 + 21 =", and "59 + 23 =", using the Minicomputer. The calculations can be derived from the aquarium story, if you wish.

F59 A +3 Spiral

CAPSULE LESSON SUMMARY

Draw a +3 spiral starting with 0 and label the rest of the dots. Relate adding three to counting by threes and demonstrate on the number line.

MATERIALS

Teacher: Colored chalk
Student: Colored pencils; unlined paper; Worksheet F59

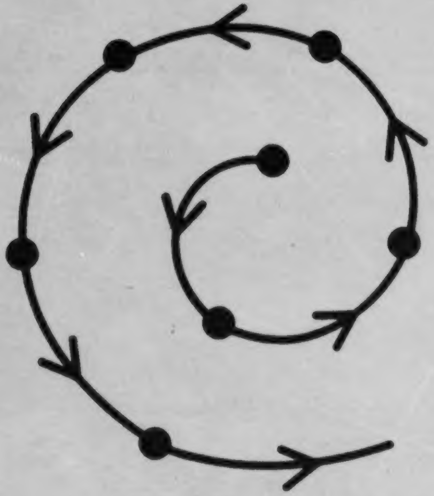
DESCRIPTION OF LESSON

Begin the lesson with a mental arithmetic activity. Try to include at least one activity which involves adding 2 to a given number. One way to do this is to explain to the students that you will give them a number and they must add 2 to this number. If you alternate easy numbers with more difficult ones, most of the class will have an opportunity to participate. You may want to let the students use their desk number lines during these activities. If so, ask them to point with their left hand to the given number and then count forward (to the right) two numbers, with their right hands.

Exercise 1

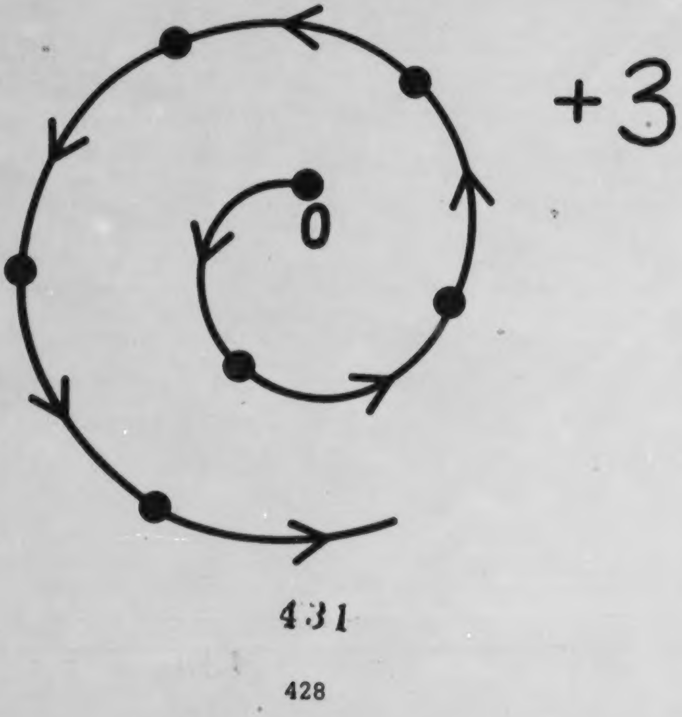
Distribute colored pencils and unlined paper. Explain to the students that you will draw an arrow picture on the board and that they should copy this picture on their papers.

Draw the picture in the next illustration on the board, one arrow at a time. Be very deliberate about adding each dot and arrow head. If you draw the picture progressively, the students will find it much easier to copy. (If you have difficulty drawing the spiral shape, you may want to draw the complete spiral lightly in white, and use this as a guide to draw the arrows.)



While the class is copying the picture, help students who are having difficulty. When all the students have drawn at least four arrows, ask them to stop and pay attention.

First, instruct them to use a red pencil to write " +3 " on their papers. Write " +3 ", in red, near the arrow picture on the board. Then, instruct the students to label the starting dot " 0 ". Do this in the picture on the board.



T: All of the arrows in this spiral are for +3.

Point to the dot for 0 with one hand, and trace the arrow starting there with the other hand. Ask the students to point to 0 and to follow the arrow on their papers.

T: 0 plus 3. What number goes here?

S: 3.

T: Label the dot for 3 on your papers.

Invite a student to label the dot in the picture on the board as you assist students who are having difficulty.

Point to the dot for 3. Instruct the class to point to "3" and then follow the arrow starting at 3 on their papers.

T: What number is 3 plus 3?

S: 6.

T: Let's see if that is right. With your left hand point to "3" on your number line. Then count three numbers forward (to the right) with your right hand.

Demonstrate this method on the classroom number line. Instruct the class to label the dot for 6 on their papers. Continue labeling the dots collectively as far as you feel is appropriate for your class, but do not feel obligated to label all the dots.

Erase all of the numbers and the "key" so that only the spiral remains. Ask the students to draw another spiral on the reverse side of their papers. Assist students who have difficulty. Worksheet F59 (both sides) is available for those students who have extreme difficulty drawing the spiral. When all of the students have begun their spiral, ask them to write "+2" on their paper with their red pencils. Write "+2" in red, on the board. Ask the students to label the starting dot "0" on their papers. Write "0" beside the starting dot on the board. Put one hand on the dot for 0 and then trace the arrow starting there with your other hand.

T: What is the red arrow for?

S: +2.

T: So we add 2. Put your left hand on "0" on your number line; now count two numbers to the right.

Demonstrate this on the classroom number line.

T: What is 0 plus 2?

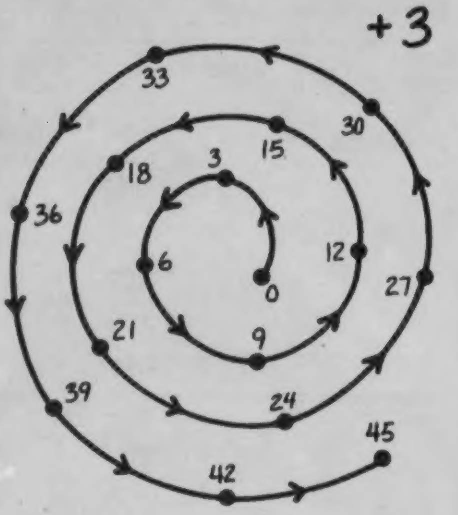
S: 2.

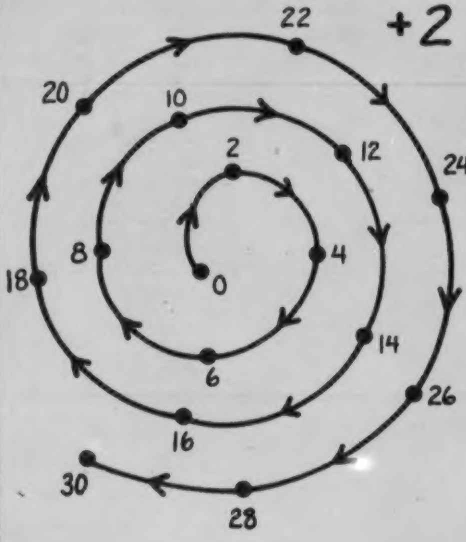
T: Now put your left hand on "2" and count two numbers to the right again. What is 2 plus 2?

S: 4.

Demonstrate this also on the classroom number line. The students should continue to count by twos on their number lines, up to "10". Then, ask them to label the dots in their arrow picture. As students finish, encourage them to extend their spirals. You may want some of the better students to also extend their +3 spirals.

Name ____________________ F59


+3


+2

F60 Adjustment Day #6

NOTE: See the General Introduction, p. 16 for a full explanation of the purpose of scheduled adjustment days.

Today you may wish to repeat a previous lesson, either for a group of students, or for the entire class. Many of the lessons can be made to appear completely different by changing the story or the numbers. Lessons which you may wish to repeat include the following.

F46.1	Plays on the Minicomputer #4
F48.1	Counting Activities #3
F49.1	Minicomputer Introduction #7
F52.2	Composition of Functions
F53	Introduction to Individual Minicomputers

If you omitted any exercises or worksheets from any previous lessons, you may wish to pursue them today, after an appropriate warm-up activity.

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with F61.1 Counting Activity #4.

The following activity may be appropriate for students who need extra help.

How Many Dots?

Draw dots on the chalkboard and have a student count them aloud. Erase the dots one by one, each time asking how many dots are left. A variation is to draw dots on the board and hide some of them. Ask the students to discover how many dots are showing, and how many are hidden.

EARLY WARNING !

Among the next nine classroom lessons are some which require extra preparation time, or which involve materials not included with the CSMP classroom set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (These special materials have been listed here only once, even if they are needed more than once during the nine-day period.)

F65.1 Coin Problem #1: small, opaque container

F69.1 String Picture with A-Blocks: loops of masking tape

F 61

F61.1 Counting Activity #4

CAPSULE LESSON SUMMARY

Count by ones around the class. Use the first counting activity to generate counting by twos starting at 2 (even numbers) and then starting at 1 (odd numbers).

MATERIALS

Teacher: None
Student: None

DESCRIPTION OF LESSON

T: Today we are going to count, and each of you will say one number in turn. After you have counted, try to remember your number.

T: John (substitute the name of the first student) will be first. John, what is your number?

S: 1.

T: Barbara (substitute the name of the second student) will be next. Barbara, what is your number?

S: 2.

T: Good. Now, let's start again. John?

Count down the first row or around the first table, asking each student to say the next whole number in turn. Continue the count (rather than starting over) with the second row or table, then with the third, and so on until each student has participated. If, for example, there are 28 students present, the last student should say "28".

T: Do you all remember your numbers?

If someone cannot remember his or her number, give the student a hint by asking the preceding student what his or her number is.

T: This time I will walk around the room and point. If I point to you, say your number.

Point to the second student and then, every other student, causing the class to count by twos. You may find it necessary to start over once or twice before the class catches on.

T: Now I will point to the students who did not participate last time; if I point to you, say your number.

Point to the first student and then every other student. Again, the students will count by twos; but this time they will say the odd numbers. You may want to repeat this activity if it does not go well at first. You may also wish to try the exercise with students counting backward; that is, point to every other student in reverse order of the original counting.

F 61

F61.2 Addition Table

CAPSULE LESSON SUMMARY

Practice addition by collectively and then individually completing addition tables.

MATERIALS

Teacher: Colored chalk

Student: Worksheet F61.2

DESCRIPTION OF LESSON

Draw this table on the chalkboard.

+	2	1	3	7
6				
5				
8				

T: Who knows which number is 5 plus 1?

S: 6.

T: Who can show us where to write "6" in the table?

When the correct answer is given, put your left index finger on "5" and your right index finger on "1". Run your left finger to the right and your right finger downward until the two meet; as you do this, say:

T: 5 plus 1 equals 6.

Write "6" in the appropriate square.

+	2	1	3	7
6				
5		6		
8				

T: Who can find a place to write "9"?

If an incorrect answer is suggested, such as the space in the lower right-hand corner, place your fingers on "8" and "7", bring your fingers together (as previously described) and ask:

T: Does 8 plus 7 equal 9?

S: No, 8 + 7 = 15.

Enter "15" in the table and continue to ask for a place to write "9". When one is correctly located, demonstrate again with your index fingers as you say:

T: Right. 6 plus 3 is 9 (or) 8 plus 1 is 9 (both are correct).

Write "9" in one of its appropriate places and ask if anyone can find another place to write "9". When the other place is discovered, demonstrate that it is also correct and enter the second "9".

+	2	1	3	7
6			9	
5		6		
8		9		

T: Who can put another number into the table?

Ask the students to tell you the remaining numbers until the table is completed. As they do so, you may want to demonstrate some of the addition facts, using either the number line or your fingers. The completed table should look like this one.

+	2	1	3	7
6	8	7	9	13
5	7	6	8	12
8	10	9	11	15

Display the front side of Worksheet F61.2 to the students and explain that they should fill in the table with the correct numbers. Students who complete the front side of the worksheet should proceed to the table on the reverse side.

Name ______________ F 61.2

+	1	2	4
3	4	5	7
5	6	7	9

+	2	6	8
4	6	10	12
7	9	13	15
5	7	11	13
9	11	15	17

F 62

F62.1 Multiplication Problem #1

CAPSULE LESSON SUMMARY

Use the Minicomputer to solve a problem with a multiplication calculation. Write both the multiplication and repeated addition calculations for this problem.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

T: Yesterday, I went to the store and bought three cartons of soda. Each carton had six bottles in it. How many bottles of soda did I buy yesterday? (18)

Accept several responses and record these on the board. Students who respond correctly should be questioned later (when the calculation is completed) about how they arrived at this answer.

T: What calculation could we do to find out how many bottles of soda I bought? What number story could I write?

The most likely response is "6 plus 6 plus 6". Write this expression on the board.

$$6+6+6$$

T: Who knows a shorter way to write this story?

S: 3 times 6.

F 62

Ask the student to write this shorter number story on the board.

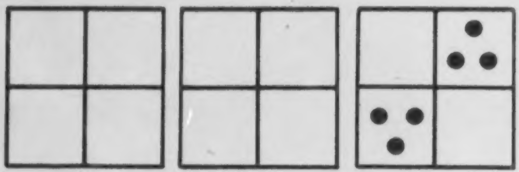
$$3 \times 6$$

You might give the class a hint for this by asking the students how many times you wrote "6". When "three times" is the response, write the story on the board as you say "three times six."

T: Let's use the Minicomputer to solve the problem. How many times do I need to put 6 on the Minicomputer?

S: Three times.

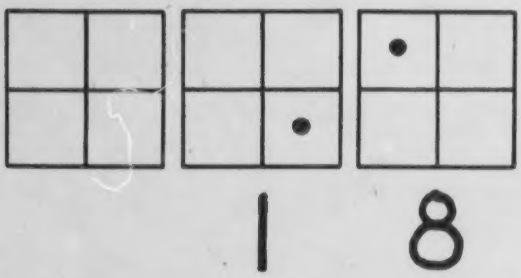
Select three students who need practice with the Minicomputer and ask each of them to put 6 on the Minicomputer. While only the standard configuration for 6 is used in the illustration below, you should accept any correct way of putting on 6.



T: Who sees a play we can make?

Call on students to make plays. Emphasize using both hands and saying the calculation as the play is made. The plays to be made here are straightforward; they are: one "2 + 2 = 4" play, two "4 + 4 = 8" plays and one "8 + 2 = 10" play. (Additional plays may be needed if non-standard configurations for 6 are used.)

T: Who can write the answer under the boards?



Complete the calculation (or calculations) on the board.

$$6 + 6 + 6 = 18$$

$$3 \times 6 = 18$$

Students who suggested this answer before the calculation was done collectively may be asked to explain how they obtained their answers. They may have difficulty verbalizing an explanation, so do not insist on clarity.

F 62

F62.2 Individual Minicomputer Activity #2

CAPSULE LESSON SUMMARY

Individually put selected numbers from 0 to 90 on the Minicomputer. Encourage standard configurations by requiring the use of at most two checkers for each number.

MATERIALS

Teacher: Minicomputer set
Student: Minicomputer set

DESCRIPTION OF LESSON

Distribute one Minicomputer sheet (containing two individual Minicomputer boards) and a container of checkers to each student. Instruct the students to each take out two checkers, leaving the rest of them in the container.

T: I am going to say some numbers. Put each number on your Minicomputer as quickly as you can, using at most two checkers. Now take a checker in each hand and get ready.

Maintain a brisk pace throughout the lesson, choosing numbers at random from the following:

0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 14, 18, 20

Circulate around the room checking the students' answers. There is more than one way to put 2, 4, 8, 10, 12, and 20 on the Minicomputer (some of these require only one checker). If a certain number seems to be particularly difficult, you may ask a student to put that number on the demonstration Minicomputer and to write the numeral under the boards. Sometimes when two different ways to put on a number are found, you may want to put both configurations on the demonstration Minicomputer.

If this lesson has gone particularly well, you may wish to extend the list of numbers to include the following:

21, 22, 24, 28, 40, 41, 42, 44, 48, 80, 81, 84, 88, and 90.

All of these numbers may be put on the Minicomputer with either one or two checkers.

F 63

F63.1 Subtraction Story #1

CAPSULE LESSON SUMMARY

Present a subtraction story using a string picture. Do the subtraction calculation and write appropriate number stories.

MATERIALS

Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

Choose one of the students in your class to be the "star" of this story. You may also wish to substitute another version of the story which would be more appropriate for your class.

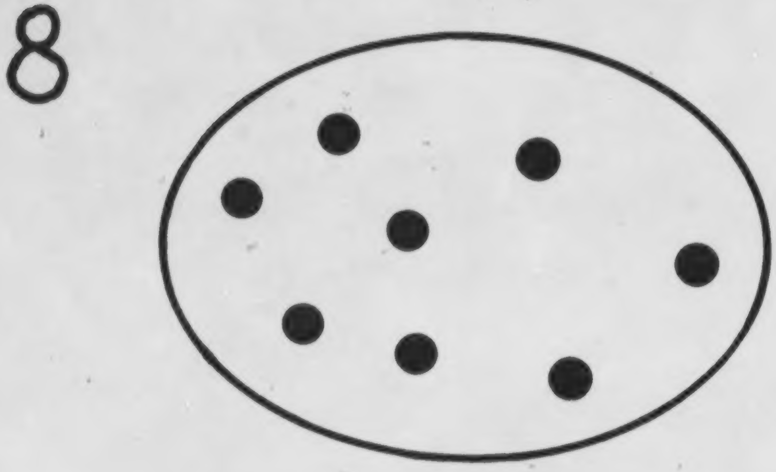
T: Ricky has eight pets at his house. Who could tell us what a pet is?

Allow some time for the class to discuss this.

T: All of Ricky's pets are parrots and some of these parrots are still babies. Today Ricky gave five of the parrots to his uncle. How many parrots does Ricky have now? (Three)

Allow the students to comment. You may wish to ask any students who answer correctly to tell the class how they found the answer.

On the board, draw a string picture (see next illustration) and write "8", near the picture. Be sure to write "8" in the same color as the string.



T: Inside of this string are all of the parrots that were living at Ricky's house before he gave some away. How many parrots were there?

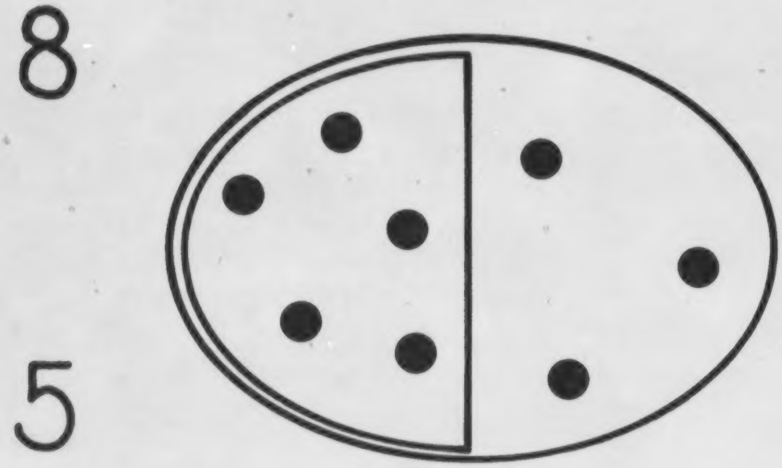
S: Eight.

T: How many parrots did Ricky give away?

S: Five.

T: I am going to draw a string around the parrots Ricky gave away.

Write "5" near the string picture using the same color as this new string.

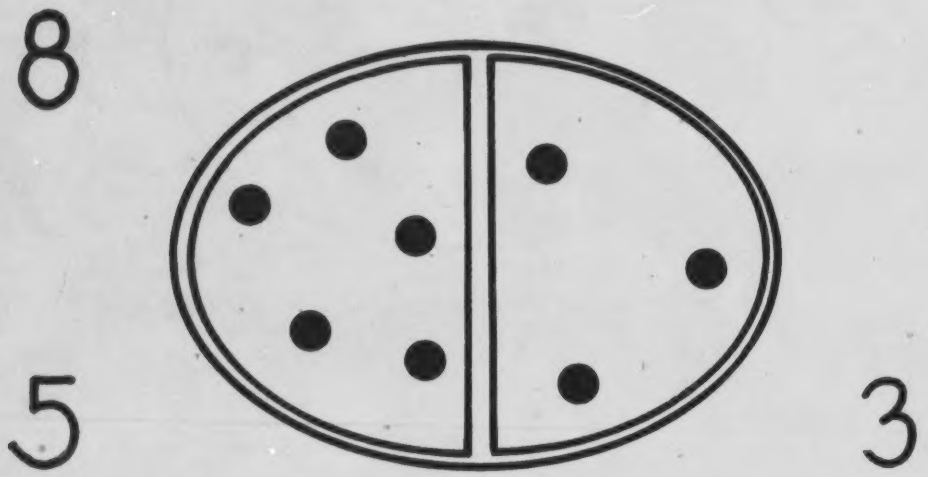


F 63

T: How many parrots does Ricky have now?

S: Three.

T: I'll draw another string around the parrots Ricky still has.



T: Who can point to the parrots Ricky gave away? Who can point to the parrots Ricky still has?

Call on students to point to the dots.

T: Who can tell us a number story for this string picture?

Accept all number stories which are appropriate for this string picture. For example, "8 = 5 + 3" is descriptive of this string picture, but "2 + 1 = 3" is not.

Do not insist that the students find several of these number stories. If necessary, suggest the "8 - 5 = 3" number story yourself. "8 - 5 = 3" can be read, "eight take away five is three" or "eight minus five is three."

F63.2 A +1 and +2 Spiral

CAPSULE LESSON SUMMARY

Draw a spiral with alternating +1 and +2 arrows and label the dots of this spiral. Individually label the dots of other similar spirals.

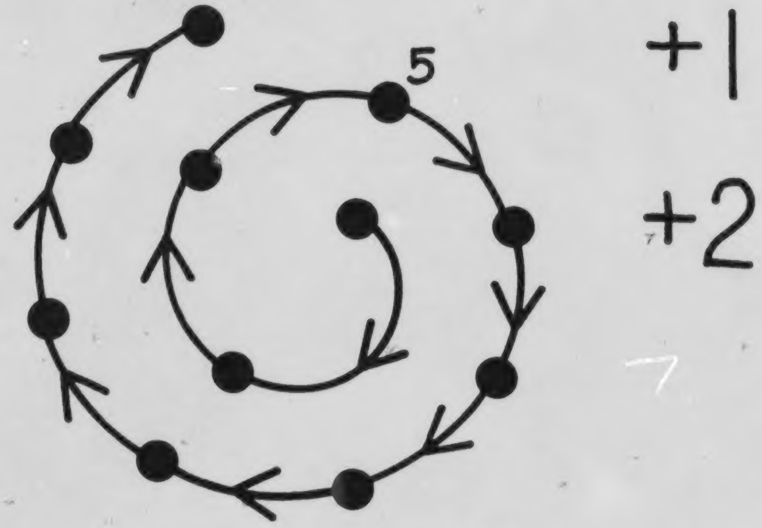
MATERIALS

Teacher: Colored chalk

Student: Colored pencils; Worksheets F63.2* and **

DESCRIPTION OF LESSON

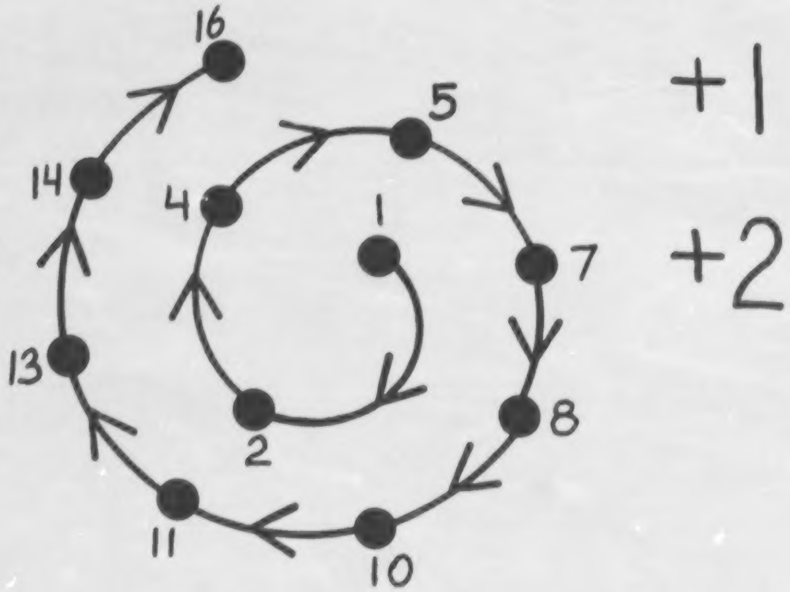
Draw the following arrow picture on the board.



T:	What are these arrows for?
S:	The red arrows are for +1.
S:	The blue arrows are for +2.
T:	When we follow a red arrow, we must add 1. When we follow a blue arrow we must add 2. Who would like to label one of these dots?

F 63

Continue calling on students until all the dots are labeled. Frequently ask the students how they know a dot is for a particular number.



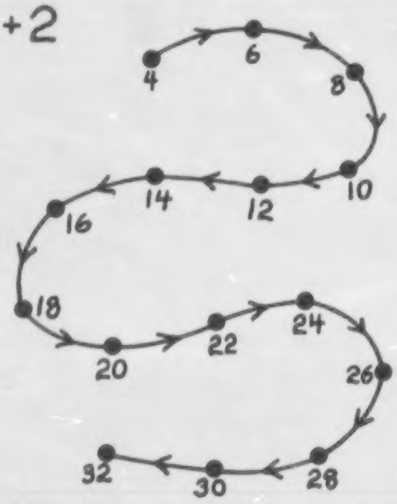
Worksheets F63.2* and ** are available for the remainder of the lesson.

Name ____________________

F 63.2 *

Label the dots.

+2

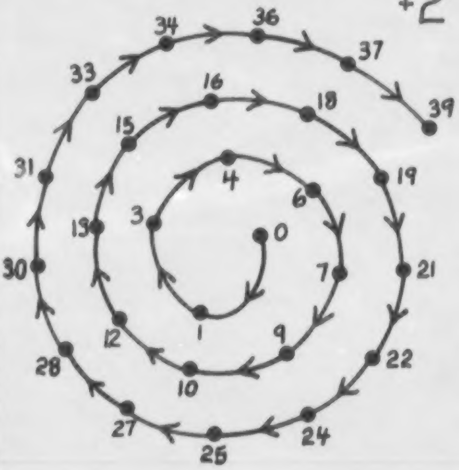

4
6
8
10
12
14
16
18
20
22
24
26
28
30
32

Name ____________________

F 63.2 **

Label the dots.

+1
+2


0
1
3
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7
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39

F 64

F64 Individual Minicomputer Activity #3

CAPSULE LESSON SUMMARY

With different color checkers on the Minicomputer, examine ways to represent 7. Individually put selected numbers from 0 to 100 on the Minicomputer. Solve an addition problem on the Minicomputer and write the corresponding number story.

MATERIALS

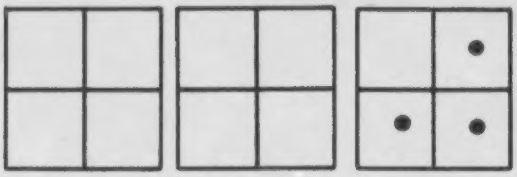
Teacher: Minicomputer set

Student: Minicomputer set

DESCRIPTION OF LESSON

T: Who can put 7 on the Minicomputer?

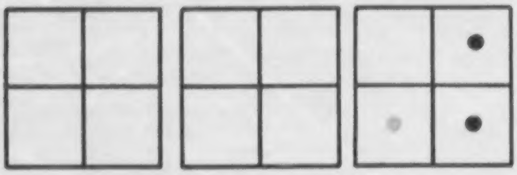
Give the student who volunteers several (more than necessary) blue checkers, although the student is likely to suggest the standard configuration.



If the standard configuration is not suggested, ask who can put 7 on the Minicomputer with fewer checkers until the standard configuration is obtained.

T: Watch carefully; one of the checkers is changing color!

Substitute a yellow checker for one of the blue ones.



T: What number is in yellow? (2)

What number is in blue? (5)

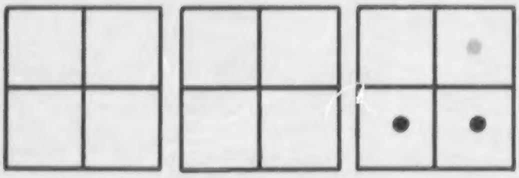
What number is in both colors together? (7)

Write this number story on the board.

$$2 + 5 = 7$$

T: Can anyone rearrange these three checkers and still show 7?

Here is one possible suggestion.



T: What number is in yellow? (4)

What number is in blue? (3)

What number is in both colors together? (7)

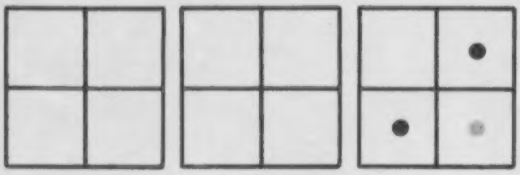
Write this new story on the board.

$$4 + 3 = 7$$

F 64

T: Who can rearrange these checkers in another way, and still show 7?

Here is a third possibility.



T: What number is in yellow? (1)
What number is in blue? (6)
What number is in both colors together? (7)

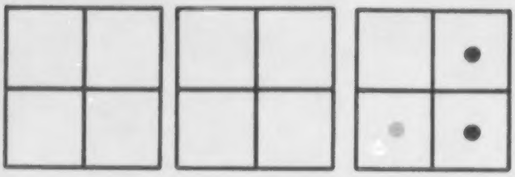
Write this number story on the board.

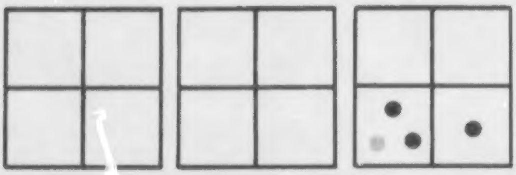
$$6 + 1 = 7$$

If a student suggests "1 + 6 = 7", "3 + 4 = 7" or "5 + 2 = 7" in addition to the other stories, write these also.

T: Can anyone put 7 on the Minicomputer using three colors?

There are quite a few correct possibilities here, two of which are shown below.





For any correct configuration, ask which number is shown in blue, which in yellow, which in red, and then which number is in the three colors all together. Write the appropriate number story ("4 + 2 + 1 = 7" for the first example shown; "3 + 2 + 2 = 7" for the second example; and so on) for each suggestion.

Distribute individual Minicomputers and checkers to the class. Instruct the students to take out only two checkers, leaving the rest of them in the container.

T: I will say a number; as quickly as you can, put it on your Minicomputers. You won't need more than two checkers. Hold one checker in each hand, and be ready and thinking.

Choose several numbers, at random, from the following list.

0, 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 14,
18, 20, 21, 22, 24, 28, 30, 40, 41, 42, 44,
48, 50, 60, 80, 81, 82, 84, 88, 90, 100

Walk around the room during this individual work, offering help and encouragement where necessary. If a certain number seems particularly difficult, ask someone to put it on the demonstration Minicomputer.

T: Take one more checker from your containers. How many checkers do you have now? (Three) Now I'm going to give you some new numbers to put on your Minicomputers. This time, you may use all three checkers if necessary.

Offer several numbers for the students to put on their Minicomputers. Choose numbers from the list above or from this new list.

7, 13, 15, 16, 19, 23, 25, 26, 29, 31, 32,
34, 38, 43, 45, 46, 49, 51, 52, 54, 58, 61,
62, 64, 68, 70, 83, 85, 86, 89, 91, 92, 94,
98

F 64

It is possible (but much more difficult) to use three checkers to put the following numbers on just two boards of the Minicomputer.

17, 36, 56, 96, 101, 102, 104, 108, 110, 120, 140, 180

Continue this activity only as long as it remains interesting for the class. When interest begins to fade, tell the following story substituting names of students in your class.

T: Suppose Patty is going to a birthday party for Mike. She must buy a present. Her mother takes her to a toy shop and Patty decides to buy two little toy cars. She picks out a station wagon for 42¢ and a sports car for 29¢. How can we find out how much she spent all together?

S: Add 42 and 29.

Write the appropriate calculation on the board.

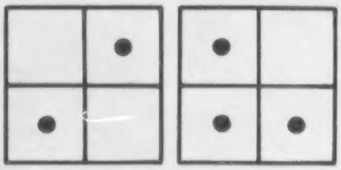
42 + 29 =

T: Let's do the calculation on the Minicomputer. Put 42 on your Minicomputers.

Invite a student to put 42 on the demonstration Minicomputer.

T: Since we are adding, leave 42 on the Minicomputer and put on 29.

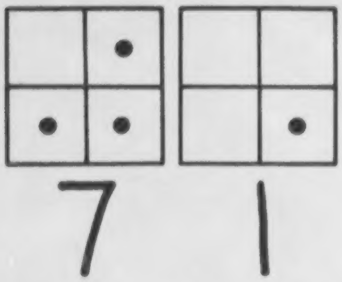
Invite a student to add 29 to the demonstration Minicomputer.



42 + 29 =

T: Your Minicomputer should now look like mine. Has anyone figured out the answer?

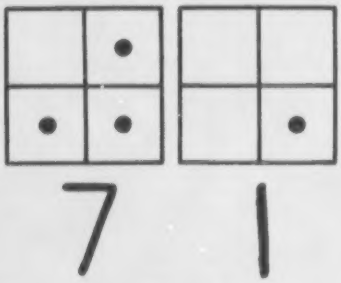
Give the students a moment to ponder this and to make a play. Then, ask a student to make the play on the demonstration Minicomputer and write the answer below the boards.



$42 + 29 =$

T: Who would like to finish writing our number story?

Call on a student to complete the calculation.



$42 + 29 = 71$

F 65

F65.1 Coin Problem

CAPSULE LESSON SUMMARY

Using several clues about the coins in a container, discover which coins they are. After each clue explore the many possibilities of coin combinations and corresponding amounts of money.

MATERIALS

Teacher: One dime, nickel and penny; a small container

Student: None

DESCRIPTION OF LESSON

Before the lesson begins, put a dime, a nickel, and a penny into a small container (chosen so that the students cannot see the coins, but can hear them clearly when the container is shaken).

T: Today you are going to be detectives again. You must discover which coins are in this container.

Hold the container up high and shake it. Allow a few students to shake it also.

T: Which coins could be in this container?

S: Three dimes.

T: There could be three dimes in this container. Three dimes is how many cents?

S: 30¢.

A student might suggest 100 pennies. Shake the container and ask the student to shake the container also.

T: Do you still think there could be 100 pennies in this container?

S: No, there aren't that many coins.

T: Do you have another idea?

S: 27¢.

T: What coins could we use to make 27¢?

S: Two dimes and seven pennies.

Keep this part of the lesson moving briskly. If the class lingers for too long on one problem -- such as deciding which coins could make 27¢ -- allow the problem to remain unresolved and move on to accept another student's suggestion.

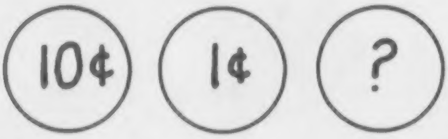
When a student suggests a specific group of coins, ask how many cents that would be. If a student suggests an amount (in cents), ask which coins could make this amount. Do not record these suggestions on the board. After a few minutes, continue.

T: Here is a clue. There are exactly three coins in this container. What could these three coins be?

Accept some additional suggestions. Continue as before, but emphasize that there are three coins in the container.

T: Here is another clue. One of the coins is a dime and one of the coins is a penny.

On the board, draw three circles of equal size.



F 65

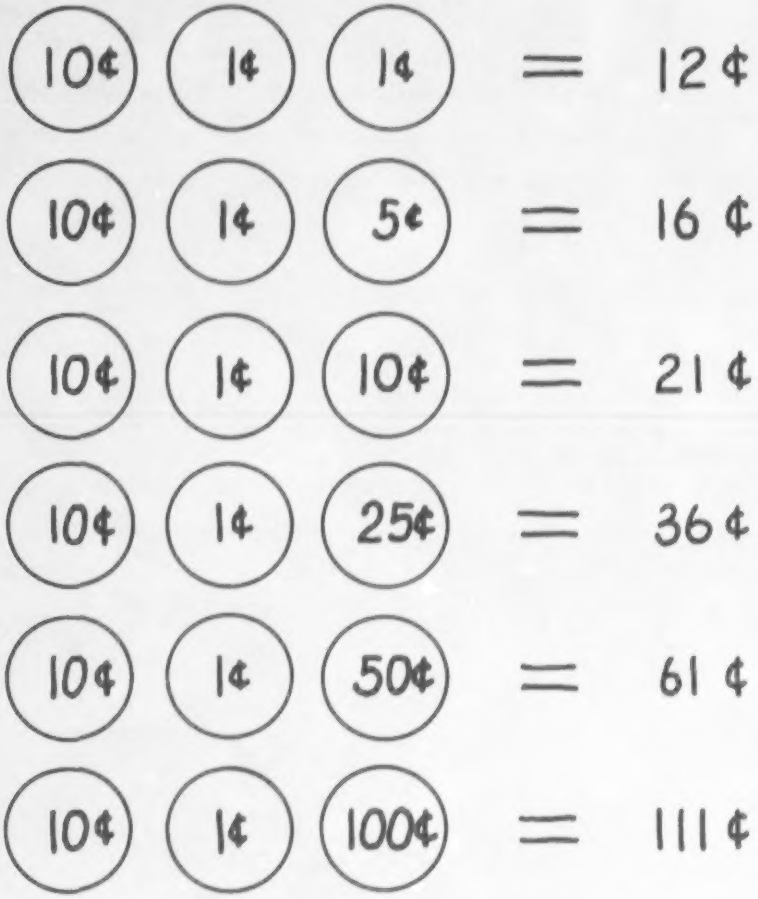
T: What could this third coin be?

S: A quarter.

T: It could be a quarter. How many cents would that be all together?

S: 36¢.

Continue accepting suggestions for the third coin as long as the students continue to make them; there are six possibilities. Do not record them on the board or insist that your class find all six of them; this list is supplied for your reference.


10¢ 1¢ 1¢ = 12¢
10¢ 1¢ 5¢ = 16¢
10¢ 1¢ 10¢ = 21¢
10¢ 1¢ 25¢ = 36¢
10¢ 1¢ 50¢ = 61¢
10¢ 1¢ 100¢ = 111¢

T: Here is the last clue; when you know which is the third coin, you can whisper it to me. There is exactly 16¢ in this container.

Accept several whispers before asking a student to answer aloud. Then reveal that the coins in your container are indeed . . . a penny, a dime, and a nickel.

F 65

F65.2 Multiplication Story #1

CAPSULE LESSON SUMMARY

Draw a string picture for a story which involves a multiplication problem and use the picture to solve the problem. Write calculations for this problem.

MATERIALS

Teacher: Colored chalk
Student: Paper; colored pens, pencils or crayons

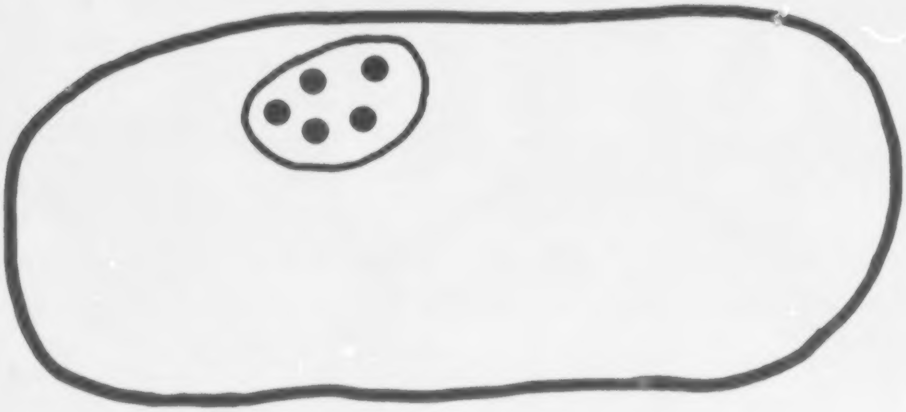
DESCRIPTION OF LESSON

Distribute paper and colored pencils to the students.

T: Suppose Brad (substitute the name of a student in your class) has eight packs of chewing gum. Each of his packs has five pieces in it. Do you think he has enough pieces to give a piece of gum to everyone in our class?

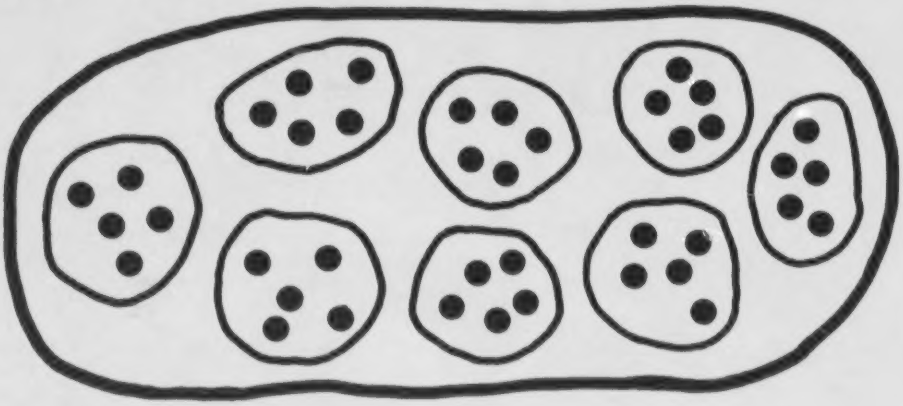
Allow time for a short discussion of this problem and encourage the students to guess how many pieces of gum Brad has. Record several guesses on the board. Students who correctly guess "40" may be asked later on how they obtained this answer.

Draw the following picture on the board.



T: Here I have one of the packs of chewing gum with five pieces of gum. Draw a picture on your paper showing all of the pieces of gum that Brad has. Remember, he has eight packs of gum.

Walk around the class, offering advice and encouragement where it is needed. Some students may require help to get started. When you see several students whose drawings are similar to the completed one shown below, ask these students to take turns and help complete the drawing on the board.



As other students complete their pictures, ask them to write a number story which tells how many pieces of gum Brad has all together.

T: Who knows a number story about this picture?
What calculations should I write?

S: 5 + 5 + 5 + 5 + 5 + 5 + 5 + 5.

Write this expression on the board and then ask for a shorter calculation. If no one suggests "8 x 5", hint at this calculation by asking how many times five pieces of gum were drawn. When "8 x 5" is suggested, write it on the board.

T: How many pieces of gum are there all together?

F 65

S: 40.

T: Let's count them to be sure. There are five pieces in each pack, so we can count by fives.

Point to each pack of gum in the picture as the class counts by fives up to 40. Then, complete the calculations on the board.

$$5+5+5+5+5+5+5+5=40$$

$$8\times 5=40$$

F66 Addition Problem #5

CAPSULE LESSON SUMMARY

Practice putting numbers on the Minicomputer and reading numbers on the Minicomputer. Solve some addition problems on the Minicomputer and write the calculations.

MATERIALS

Teacher: Minicomputer set.

Student: Minicomputer set; Worksheets F66*, **, and ***

DESCRIPTION OF LESSON

Begin the lesson with five to ten minutes of recognizing and putting various numbers on the demonstration Minicomputer.

T: Who would like to put my secret number on the Minicomputer?

After choosing some number of appropriate difficulty, select a volunteer and whisper your number to the student. When the volunteer has put the number on the Minicomputer, continue.

T: Who knows what the secret number is?

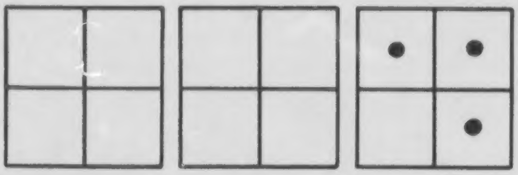
Ask a second student to write the numeral under the Minicomputer boards, and then ask the first student if this was the secret number. Repeat this activity several times with new volunteers.

T: Now, let's tell a story about Alice (substitute the name of a student in the class). Alice had eight crayons, and a friend gave her five more. How many crayons does Alice have all together?

Several students may know the answer without using the Minicomputer; tell them you will use the Minicomputer to check the answer, and then do so.

When the calculation is finished, be sure to compliment students who answered correctly.

Ask two students to put on the checkers for 8 and 5 respectively. With standard configurations for 8 and 5, the Minicomputer looks like this.

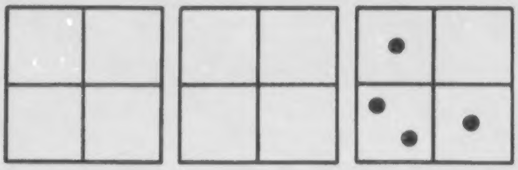


T: Who sees a play we can make?

Since the backward play "4 = 2 + 2" has already been introduced to the students, one of them may suggest it. If not, say:

T: We need a checker on the 2-square to go with the checker on the 8-square. How can we get a checker on the 2-square? Then we could make the "8 + 2 = 10" play.

If the backward play is still not suggested, point to the checker on the 4-square and ask for a play with this checker. The "4 = 2 + 2" play will result in this configuration.

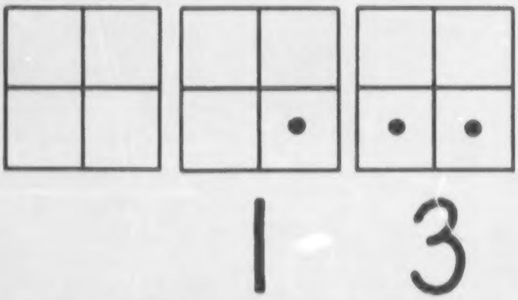


T: Who sees another play?

Someone may suggest making the "2 + 2 = 4" play.

T: That is a good play, but it would put us right back where we started. Do you see another play we could make?

After the "8 + 2 = 10" play has been made, ask a student to write the appropriate numerals under the Minicomputer boards.



Next to the Minicomputer, write this number story.

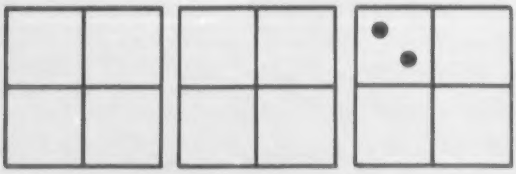
$$8+5=13$$

T: Now, let's try a story that is a little harder. This one is about Barbara (once again, substitute the name of a student in your class). Barbara had eight pennies. One Saturday she worked in the yard and earned eight more pennies. How many pennies does she have all together?

Write this calculation on the board . . .

$$8+8=$$

. . . and ask students to put the appropriate checkers on the Minicomputer.



Some students may already know the answer and may suggest putting 16 on the Minicomputer in the standard configuration. Tell them that perhaps this is correct, but that you would like to make plays to be sure. Be sure to compliment these students after the calculation is completed.

T: Who sees a play?

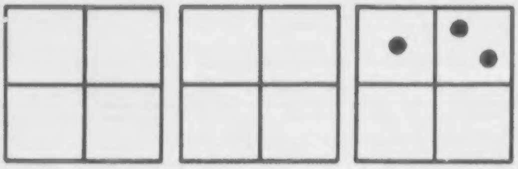
You may have to give a hint which suggests a backward play.

T: We need a checker on the 2-square to go with the checker on the 8-square. How did we get a checker on the 2-square last time?

S: With the "4 = 2 + 2" play.

T: Yes; but we don't have a checker on the 4-square this time. How can we get one there?

Again, you may have to hint at the "8 = 4 + 4" backward play by pointing to one of the checkers on the 8-square and asking how to make a play with this checker. This should lead to the following configuration.

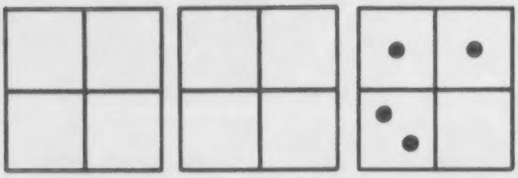


T: Who sees another play?

Someone may suggest the "4 + 4 = 8" play.

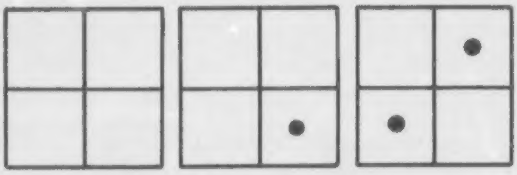
T: That's a good play, but it would put us back where we started. We still need a checker on the 2-square to go with the one on the 8-square.

After a "4 = 2 + 2" play is made, this configuration will be on the Minicomputer.



T: Who sees another play?

S: 8 + 2 = 10.



When 16 is in the standard configuration (above), ask a student to write the numeral under the Minicomputer and complete the calculation on the board.

8+8=16

Distribute Worksheet F66* along with individual Minicomputers and checkers. As students complete Worksheet F66*, give them (in turn) Worksheets F66** and ***.

On some pages of the worksheets, students have simply to read the number on the Minicomputer. On others, they are asked to do some addition problems. The Minicomputers pictured on these latter pages have checkers for the numbers to be added, but no plays have yet been made. Students should put the given numbers on their individual Minicomputers, make the plays, and when they have found the answers, complete the number story.

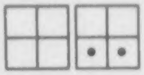
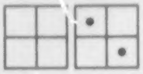
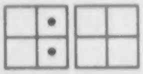
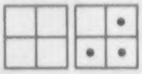
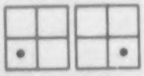
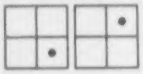
F 66

It is to be expected that your students will not be very adept with their Minicomputers as yet; be patient. Walk around the room during this time and encourage the students to work carefully and not to rush.

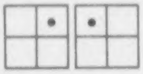
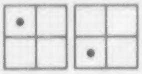
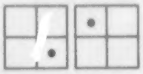
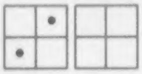
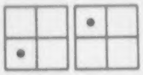
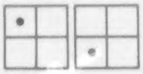
Name

F 66 *

What number is on the Minicomputer?

 3	 9
 5 0	 7
 2 1	 1 4

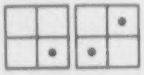
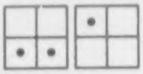
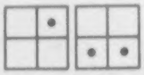
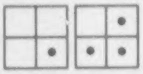
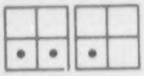
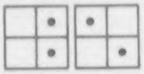
What number is on the Minicomputer?

 4 8	 8 2
 1 8	 6 0
 2 8	 8 2

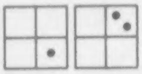
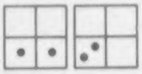
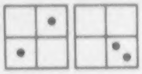
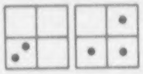
Name

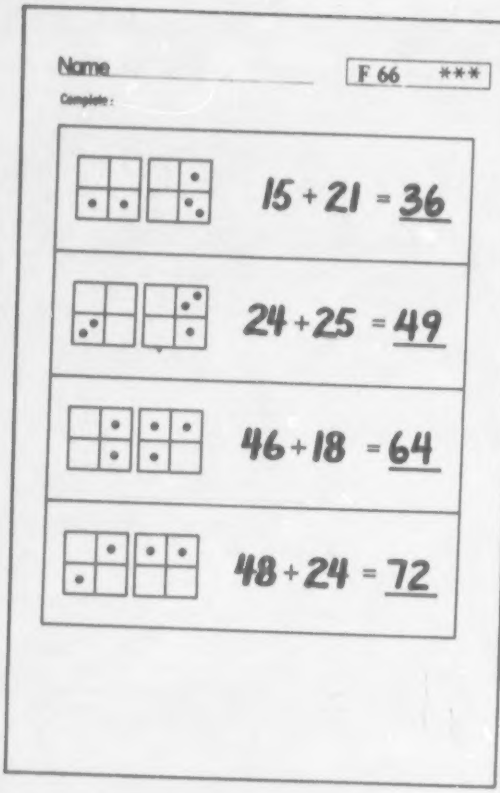
F 66 **

What number is on the Minicomputer?

 1 6	 3 8
 4 3	 1 7
 3 2	 5 9

Complete:

	14 + 4 = 18
	12 + 22 = 34
	41 + 21 = 62
	25 + 22 = 47



Name ________________________ F 66 ***

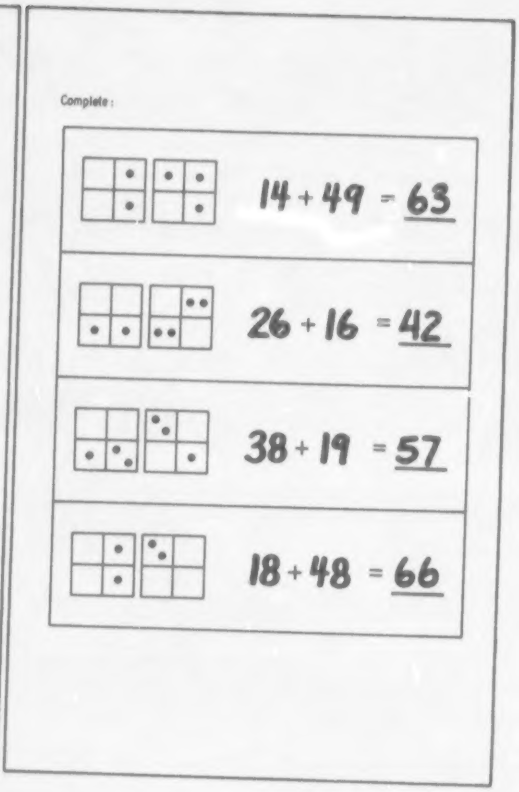
Complete :

15 + 21 = 36

24 + 25 = 49

46 + 18 = 64

48 + 24 = 72



Complete :

14 + 49 = 63

26 + 16 = 42

38 + 19 = 57

18 + 48 = 66

F67.1 Subtraction Story #2

CAPSULE LESSON SUMMARY

Use a string picture to present a story which involves subtraction and solve the subtraction problem. Write the related subtraction and addition sentences for this story.

MATERIALS

Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

Choose one of the students in your class to be the "star" of this story. You may also wish to substitute a story which would be more interesting to your class.

T: Sandra's family has 11 motorcycles. Who could tell us what a motorcycle is?

Allow time for the students to discuss the question.

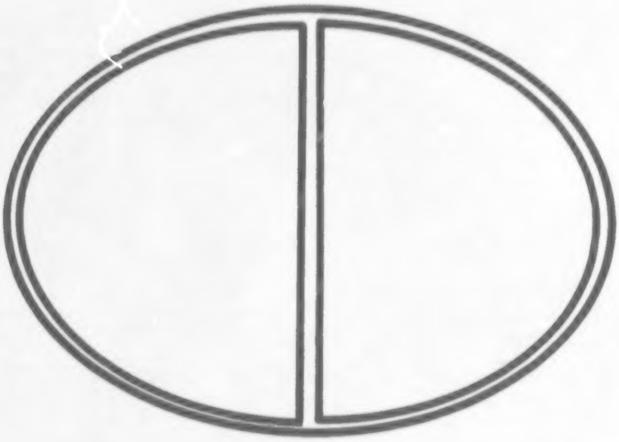
T: Three of the motorcycles are Yamahas. All of the other motorcycles are Hondas. How many Honda motorcycles does Sandra's family have?

S: Eight.

Allow several students to answer or comment before affirming an answer. You may wish to ask students who answer correctly to tell the class how they found the answer.

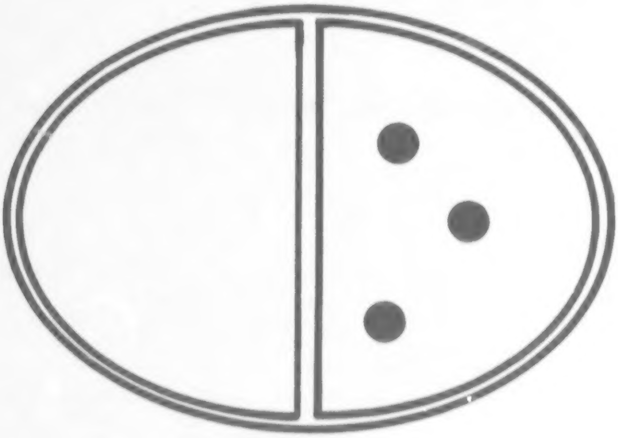
F 67

Draw this string picture on the board.



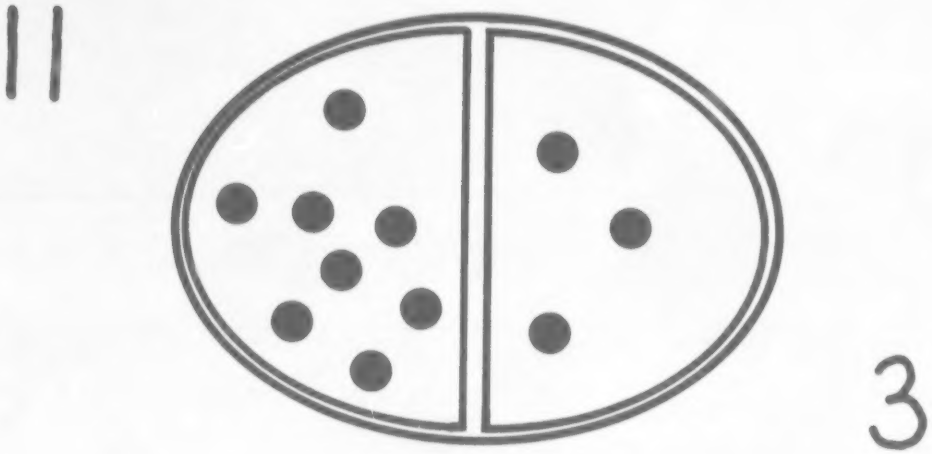
T: The purple string is for all the motorcycles that Sandra's family has. The blue string is for the Honda motorcycles. The red string is for the Yamaha motorcycles.

How many Yamahas does Sandra's family have? (Three) Who could draw dots in this string picture for the Yamaha motorcycles?



T: There are three dots inside the red string so I will write "3" in red near the picture.

T: How many motorcycles does Sandra's family have all together? (11) I will write "11" in purple near the picture. Three of the motorcycles are Yamahas. The other motorcycles are Hondas. Who could draw dots in this string picture for the Honda motorcycles?



T: How many dots are in the blue string? (Eight) I will write "8" in blue near the picture. Who can tell us a number story for this string picture?

Accept any of these number stories.

8 + 3 = 11
3 + 8 = 11
11 + 3 = 8
11 - 8 = 3

If necessary, you could suggest some of these number stories yourself.

F 67

F67.2 +1 and +2 Arrow Picture #2

CAPSULE LESSON SUMMARY

Given a set of numbers in a dot picture, draw all the possible +1 and +2 arrows and write the related addition sentences.

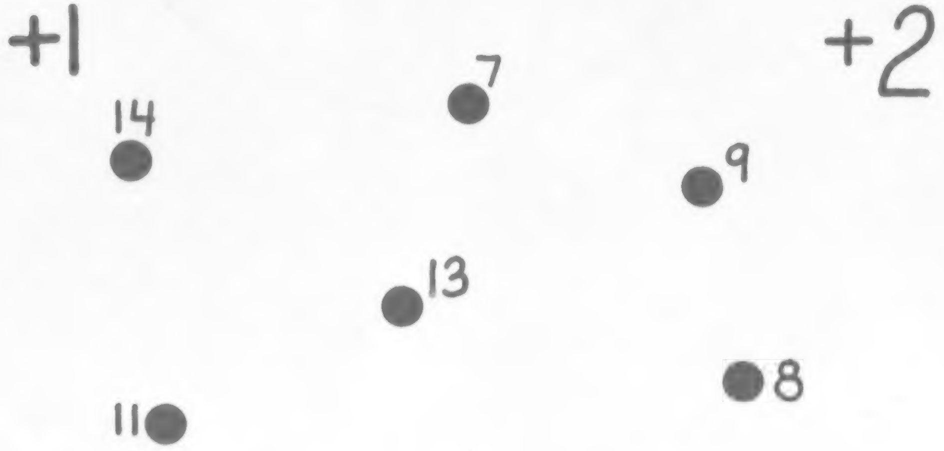
MATERIALS

Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

Draw this picture on the board.



T: Who can show us where we could draw a +1 arrow?

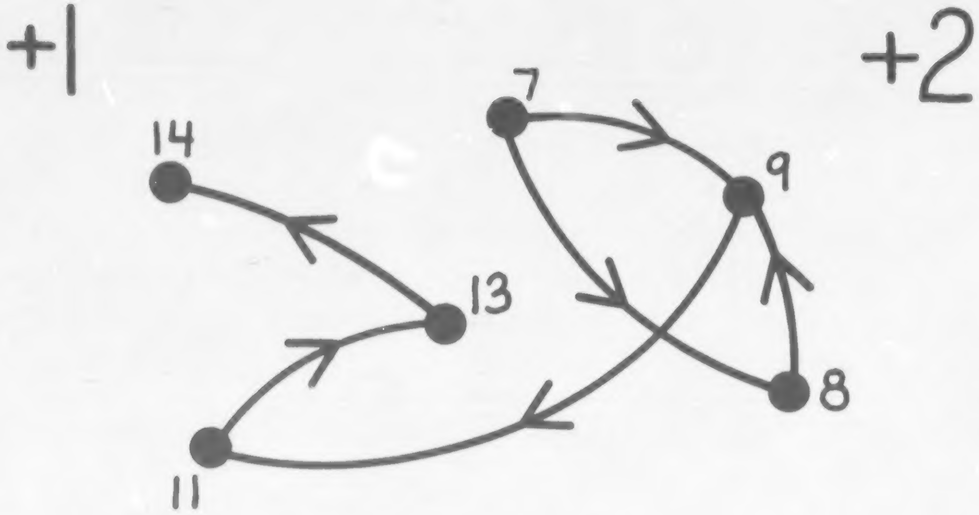
Let a student come to the board and trace an arrow. If the arrow is correct, draw it yourself. Write the appropriate number story on the board to one side of the arrow picture. Ask the class to help you check each arrow that is suggested. For example, with an incorrect response, trace the suggested arrow again and ask:

T: Is 7 plus 1 equal to 9?

S: No.

T: We cannot draw a +1 arrow there, then.

Continue asking for arrows and the appropriate number stories until the picture is complete.



$7+1=8$

$7+2=9$

$8+1=9$

$11+2=13$

$13+1=14$

$9+2=11$

F 68

F68.1 Addition Problem #6

CAPSULE LESSON SUMMARY

Present a story involving an addition calculation with four addends and solve the addition problem on the Minicomputer.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

T: At a school nearby, all of the first graders were going to have a picnic. Each first grader would receive one hot dog at the picnic, but the cook wasn't sure about how many hot dogs to buy. Let's see if we can help. In this school, there are four first grade classes. One class has 27 students, another has 32, the third one has 29 students, and the last one has 25 students.

As you say the number of students in each class, write the appropriate numerals on the board.

27 32 29 25

T: What should we do to find out how many first graders there are all together?

S: Add.

Continue your number story on the board.

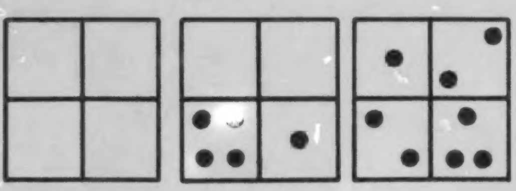
$$27+32+29+25$$

T: How many hot dogs will the cook need to buy so that every first grader will receive one?

Accept several guesses from the class and record these on the board.

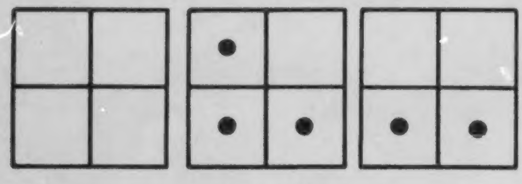
T: To find out for sure, let's solve the problem on the Minicomputer.

Ask four students one at a time, to put the four numbers on the Minicomputer. If standard configurations are suggested for each number, the Minicomputer should look like this when the students are finished.



T: Who sees a play which can be made?

Ask many students to participate in making plays. Encourage the use of both hands and the saying of the plays aloud as they are made. If your students are not yet comfortable with the hundreds' board, they may encounter difficulty when this configuration is on the Minicomputer.



Point to the checkers on the 80 - square and 20 - square.

T: What number is 80 + 20?

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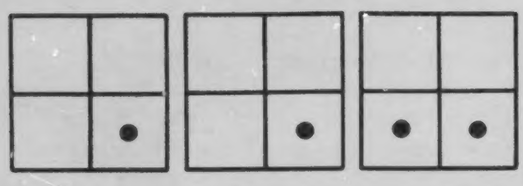
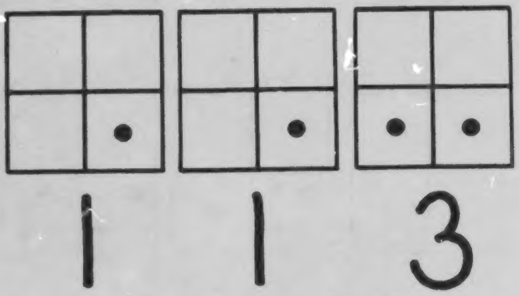
This hint should lead to the "80 + 20 = 100" play.



T: This is the number of hot dogs we need. Who can write the answer under the Minicomputer?



Complete your number story on the board as you affirm the answer.

T: Right. 27 + 32 + 29 + 25 = 113.
Which guess was the best?

Let the students discuss which of the earlier guesses was the best. Ask a student who made a close or correct guess to explain how he or she made such a good guess. Do not, however, insist on a clear or well-phrased response.

F68.2 The Function +5

CAPSULE LESSON SUMMARY

Count forward and backward by fives and tens. Use a story to generate a +5 arrow picture and label the dots in the picture to solve a problem from the story.

MATERIALS

Teacher: Colored chalk

Student: Worksheets F68.2* and **

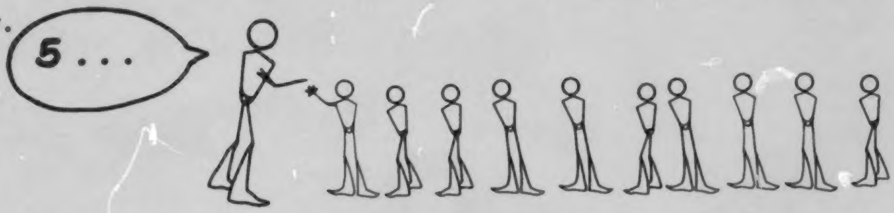
DESCRIPTION OF LESSON

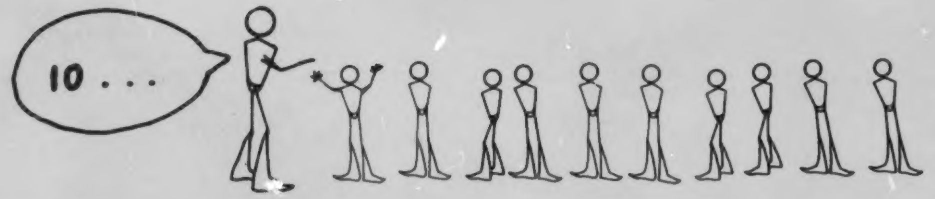
Exercise 1

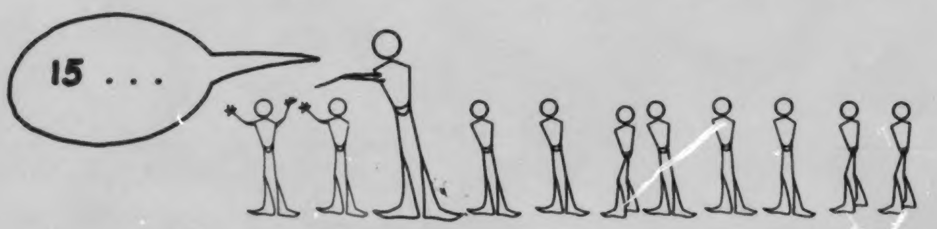
T: How many children do we need to show 100 fingers?

S: Ten.

Ask ten students to stand at the front of the room and ask the class to count by fives as the ten students in turn hold up their hands one at a time. You should move behind the students helping them to raise one hand at a time, in order.







Continue in this manner, up to 100. Then ask the class to count backward by fives as the ten students in reverse order put their hands down, one at a time.

Repeat this activity, but count forward and backward by tens this time. Then, ask the students to sit down.

Exercise 2

Tell the following story, or one similar to it, to your class.

T: Do you know about Johnny Appleseed? Johnny Appleseed was a man who in the early days of our country, traveled throughout Ohio and Indiana. Whenever he saw a good place, he planted some apple seeds. People moved into these states and they were happy to find the apple trees which had grown from the seeds Johnny had planted many years earlier.

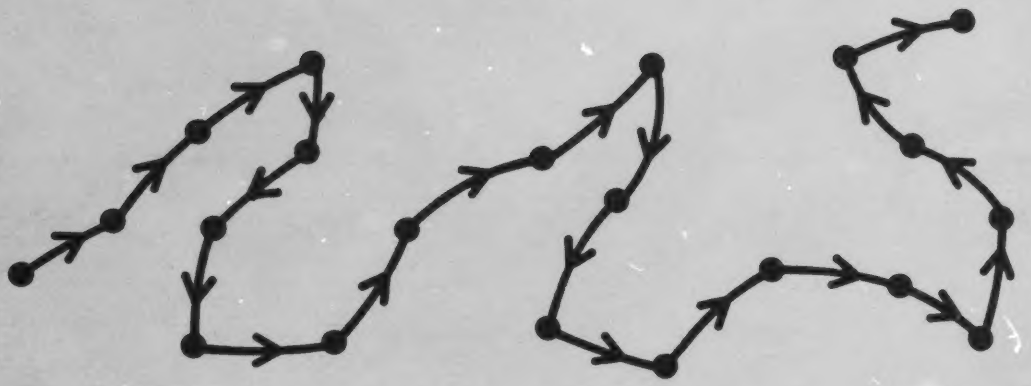
As Johnny Appleseed traveled from place to place, he was always looking for a good place to plant apple seeds. Whenever he found such a place, of course, he would plant seeds. To give a better chance that a tree would grow, he would plant five seeds each time.

You may wish to allow the students to discuss what a "good place" to plant apple seeds would be like.

T: One day, Johnny found twenty places where he planted his apple seeds. Let's show this in an arrow picture. I will draw one arrow each time Johnny planted apple seeds. How many arrows shall I draw?

S: Twenty.

Draw twenty consecutive arrows on the board.

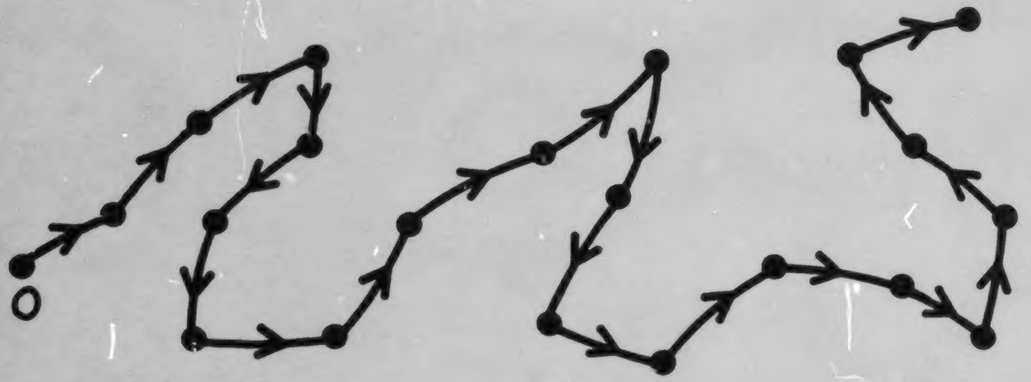


T: Each arrow shows one time Johnny planted apple seeds. How many seeds did Johnny plant that day?

Record the students' guesses on the board, and then point to the starting dot in the picture.

T: At the beginning of the day, Johnny has not planted any seeds yet, so we can label this dot "0".

Label the starting dot.



T (tracing the first arrow): What does this arrow tell us?

S: He planted some apple seeds.

F68

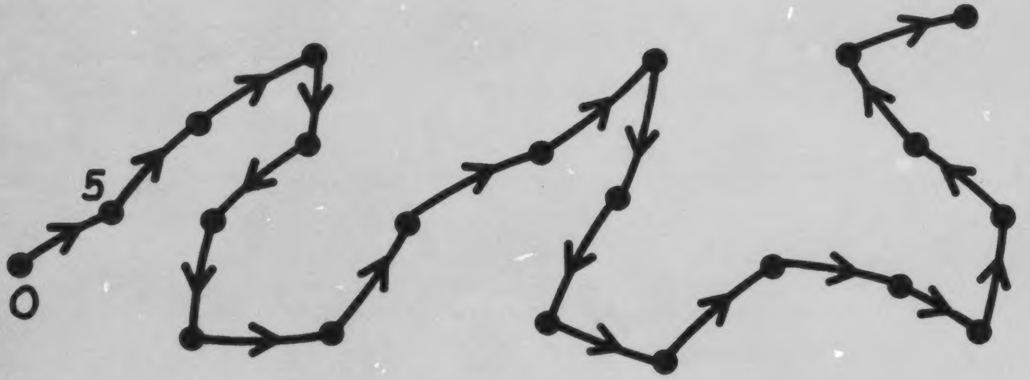
T: How many apple seeds does Johnny plant each time?

S: Five.

T: After Johnny has planted seeds just once, how many seeds have been planted?

S: Five.

Label the next dot " 5 ".



T: What could this red arrow be for? (+5)

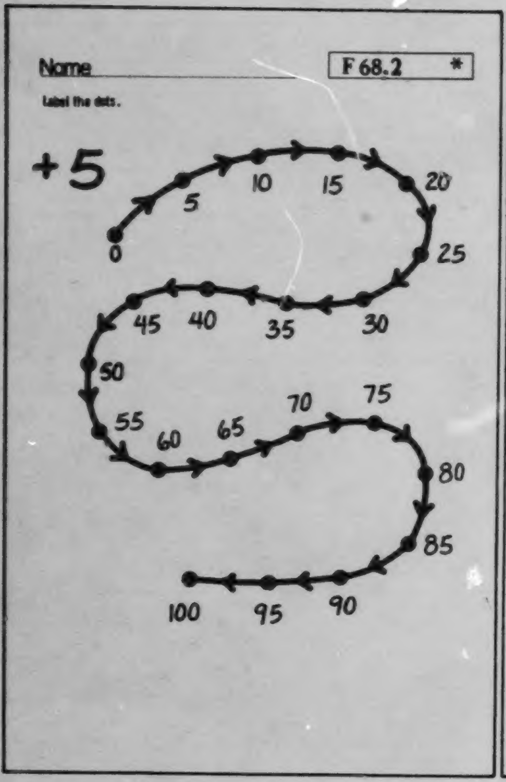
In red, write " + 5 " near the arrow picture. Trace the second arrow.

T: He planted some seeds a second time. How many seeds has he planted so far? (Ten)
How do you know? (5 + 5 = 10)
Who would like to label this dot?

Continue in this manner until all the dots have been labeled. It is not necessary to continue the Johnny Appleseed story if this becomes inconvenient.

When the arrow picture is completed, conclude with your students that if Johnny Appleseed planted seeds 20 times, then he must have planted 100 seeds all together. Determine which students gave the best guess. If any students predicted 100, ask how they found this answer.

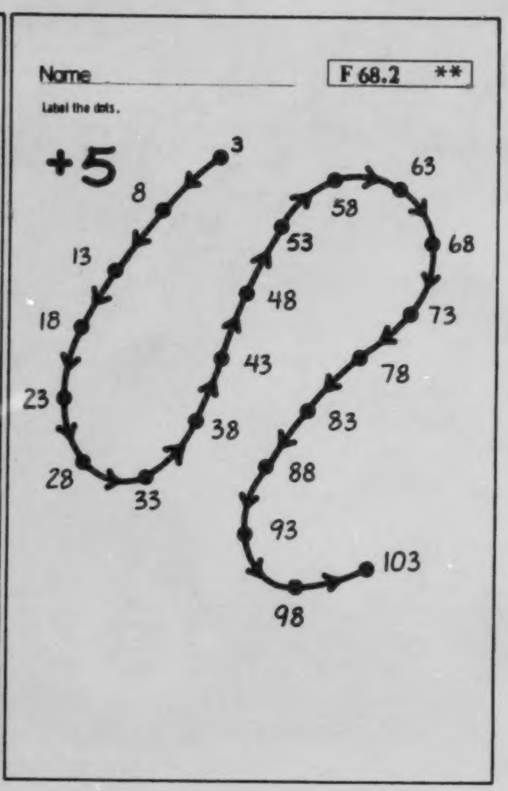
Worksheets F68.2 * and ** are available for the remainder of the lesson.



Name ____________ F 68.2 *

Label the dots.

+5
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100



Name ____________ F 68.2 **

Label the dots.

+5
3
8
13
18
23
28
33
38
43
48
53
58
63
68
73
78
83
88
93
98
103

F69.1 String Picture with A - Blocks

CAPSULE LESSON SUMMARY

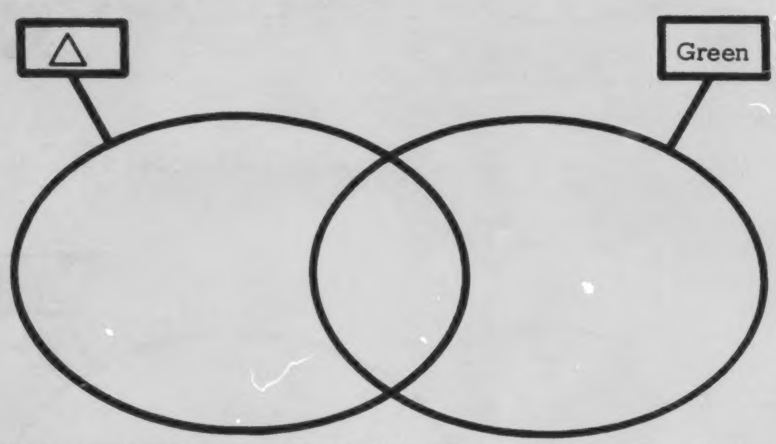
Place A-block pieces in string pictures and introduce the idea of "not" labels.

MATERIALS

Teacher: Colored chalk; A-block set; loops of masking tape
Student: None

DESCRIPTION OF LESSON

Draw this picture on the board.

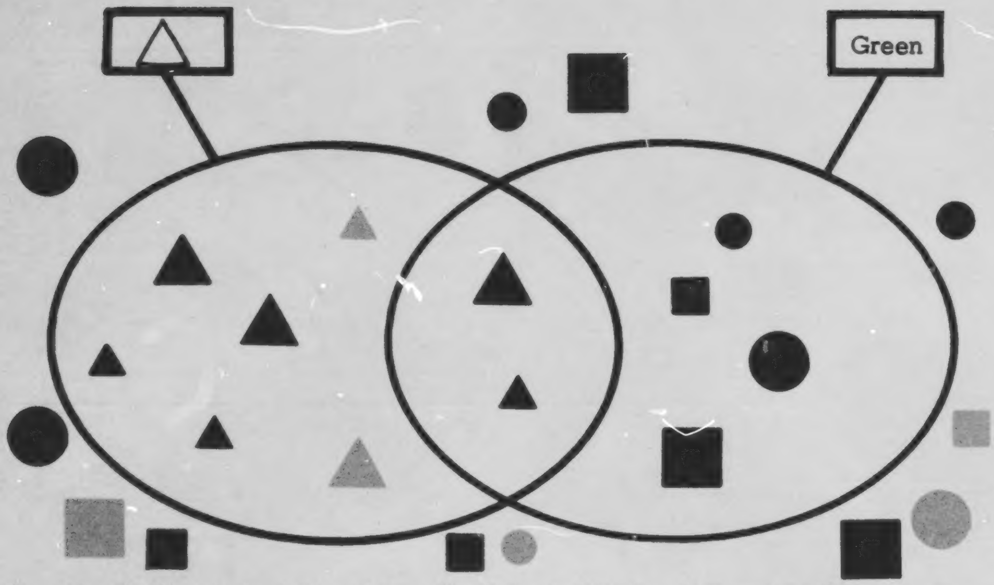


Arrange the A-block pieces on the chalkboard, but not so close to the picture as to appear a part of it.

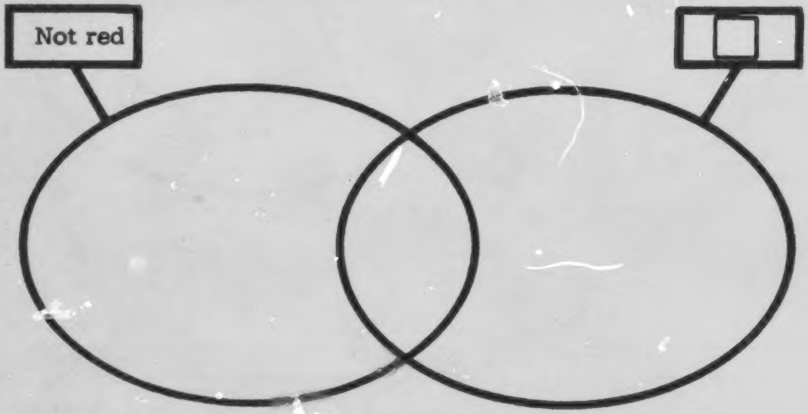
T: This string (trace the red string) is for triangles and this string (trace the blue string) is for green pieces.

Ask several students to place A-block pieces into the picture. Each time, ask if the piece is green, if it is a triangle, and if it is in the right place. If no one chooses a piece which should be placed outside both strings (such as a yellow circle), choose one yourself and ask the class where this piece should be placed. The correct placement for all the A-block pieces is shown in the next illustration.

F 69



Do not ask the students to place all of the A-blocks, however; after six or seven pieces have been placed, the class should be ready for a change. Return the A-blocks to their initial position, erase the board and draw these two strings.



T: This string (trace the blue string) is for the pieces which are not red and this string (trace the red string) is for squares.

Invite students to place pieces in the picture. As each piece is placed, ask:

T: Is it red?

S:	No.	OR	S:	Yes.
T:	So it is inside the blue string.		T:	So it is outside the blue string.

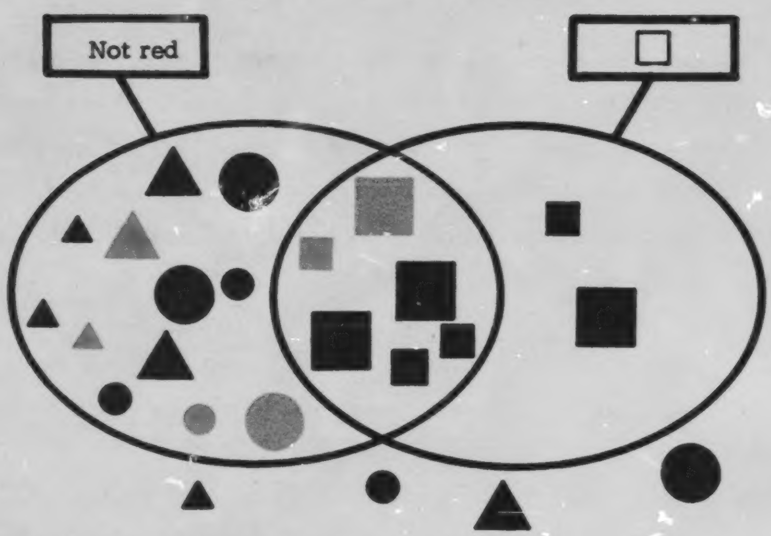
T: Is it a square?

Indicate that squares should be inside the red string and that pieces which are not squares should be outside.

T: Is the piece in its correct place?

Allow correctly placed pieces to remain and call on another student to put an incorrectly placed piece in its proper place.

The correct placement for all the A-block pieces is shown below.



Do not insist that all the pieces be placed, but be sure at least one piece is placed in each of the four regions, even if it is necessary to select some pieces yourself. Ten pieces, correctly placed, should be sufficient to demonstrate the idea of the "not" label to the class.

F69.2 Individual Minicomputer Activity #4

CAPSULE LESSON SUMMARY

Individually put numbers on the Minicomputer and do an addition calculation on the Minicomputer.

MATERIALS

Teacher: Minicomputer set

Student: Minicomputer set

DESCRIPTION OF LESSON

Distribute individual Minicomputers and checkers to each student. On the board, draw a large square.

T: I will put a number in this box. As quickly as you can, put that number on your Minicomputers. Raise your hand when you have done this.

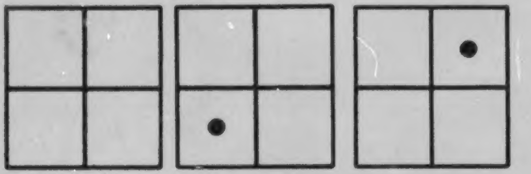
Choose numbers which are appropriate for the class. If many students still have difficulty associating a square of the Minicomputer with its respective value, use some "one checker numbers" such as 4 or 80. Another approach is to use a pattern of related pairs of numbers; for example, ask for 6 and then for 60, 5 and then 50, and so on. It might also be helpful to choose pairs of numbers with the same digits such as 12 and 21, or 38 and 83.

Rather than each time putting the number on the chalkboard, you may prefer to simply say the number aloud, thus allowing you to circulate among the students and to provide help where necessary. The class, however, may find the exercise more difficult this way. If a number seems to be particularly difficult, you may wish to ask a student to put it on the demonstration Minicomputer.

After five to ten minutes of this activity, continue with this problem.

T: Let's do an addition problem on our Minicomputers; let's add 24 and 46.

Write " 24 " on the board and allow the students time to put 24 on their Minicomputers. Then, ask a student to put 24 on the demonstration Minicomputer. The standard configuration is shown below. If another configuration is offered, accept it, but ask for plays to obtain the standard configuration before continuing. The students should also have the standard configuration on their individual Minicomputers.

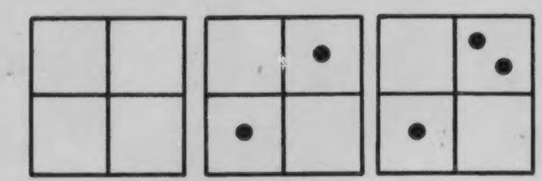


T: Now since we are going to add, leave 24 on your Minicomputers and put on 46, also.

Write the calculation on the board.

$$\begin{array}{r} 24 \\ +\,46 \\ \hline \end{array}$$

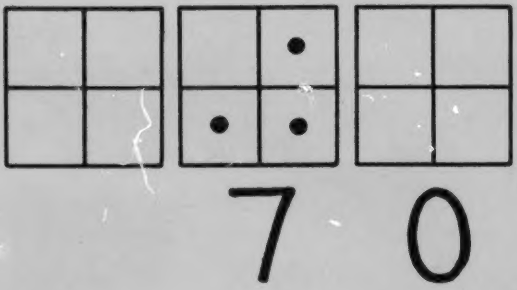
Give the students time to put 46 on their Minicomputers and then ask a student to put it on the demonstration Minicomputer.



T: This is 24 + 46. Make some plays on your Minicomputers so that you can tell me which number this is.

F 69

Allow the students to do this. Only two standard plays are useful here, so not much time should be required. Ask several students to tell you the number. Call on students to make the plays on the demonstration Minicomputer and to write the appropriate numerals under the boards.



T: Good. 24 + 46 = 70.

Complete your calculation on the chalkboard.

$$\begin{array}{r} 24 \\ +\,46 \\ \hline 70 \end{array}$$

F70 Adjustment Day #7

NOTE: See the General Introduction, p. 16 for a full explanation of the purpose of scheduled adjustment days.

Today you may wish to repeat a previous lesson, either for a group of students, or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or the numbers. Lessons which you may wish to repeat include the following.

F54	The Numbers Speak #4 (Exercise 1)
F59	A +3 Spiral
F61.1	Counting Activity #4
F62.2	Individual Minicomputer Activity #2
F67.2	+1 and +2 Arrow Picture #2

If you omitted the worksheets from any previous lesson, you may wish to distribute them today, after an appropriate warm-up activity.

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with F71.1 Addition Problem with Counting by Twos.

The following activity may be appropriate for students who need extra help.

What's Your Number?

On a card for each of the students in the group (ten at most), write one of the whole numbers from 1 up to the number of students in the group. For instance, if there are seven students in the group, you should prepare these cards: $\boxed{1}$ $\boxed{2}\boxed{3}\boxed{4}\boxed{5}\boxed{6}\boxed{7}$. Have the students face each other in a circle, after taping a card to each student's back. No one should be able to see his or her own number.

Ask one of the students what his or her number is. This student then walks around the outside of the circle, several times if necessary, looking at the other students' numbers and trying to discover his or her own number. When the student decides what the number is, he or she should point to it in the number line and face away from the group. The students in the group should check to see if the chosen number is the correct one. (As the number of players increases, this game becomes more difficult.)

EARLY WARNING !

Among the next nine classroom lessons are some which require extra preparation time, or which involve materials not included with the CSMP classroom set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (These special materials have been listed here only once, even if they are needed more than once during the nine-day period.)

F72.1	Multiplication Story #2: calendar
F73.1	Same First Initial #1: This lesson requires you to make an alphabetical list of your students' first names. See the first page of the lesson, p. 510.
F75	Tina Visits the Library: grid board
F79.2	Same First Initial #2: As for F73.1, this lesson requires a student list. See the first page of the lesson, p. 562.

F71.1 Addition Problem with Counting by Twos

CAPSULE LESSON SUMMARY

Use a counting by twos activity to generate an addition calculation on the Minicomputer.

MATERIALS

Teacher:	Minicomputer set
Student:	None

DESCRIPTION OF LESSON

T: You are going to count by twos today. When you count by twos, do you say every number?

S: No, you skip numbers.

T: That's right. To help you, I'll whisper the numbers you should skip. I'll start; (whispering) 1.

S: 2.

T (whispering): 3.

S: 4.

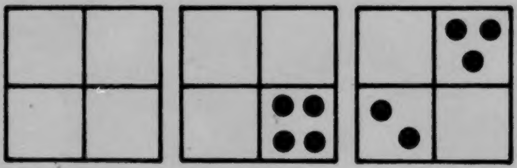
Continue until 30 is reached.

T: Now we will see how well each row (or table) can count by twos; this time, I won't say the other numbers. Mary (substitute the name of the first student in the first row or table) will say "2" and we will go down the row with each person saying the number which is two more.

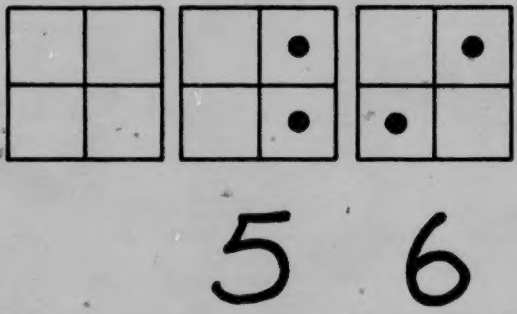
F 71

Proceed to do this, giving help where it is needed. Ask the last student in the row (or table) to put his or her number on the Minicomputer; for example, if there are seven students in the row, the last student should put 14 on the Minicomputer.

Repeat the activity with each row, always asking the last student to put his or her number on the Minicomputer. Do not clear the Minicomputer between rows. As an example, a class with four rows of seven, eight, six and seven students respectively, should put 14, 16, 12, and 14 on the Minicomputer, in that order. If standard configurations for each number are used, the Minicomputer would then look like this.



Call on volunteers to make plays. In some situations, backward plays may be needed. When a standard configuration is on the Minicomputer, call on someone to write the appropriate numerals under the Minicomputer. For example, 56 would be the result.



Let the checkers remain on the Minicomputer; do not erase the board.

T: Let's count by twos again; this time we will go around the entire class. We won't start over with each row.

Count by twos again, counting down the first row and continuing with the second, until the last student in the last row has participated.

The 0 - 109 Numeral Chart could be used to help with this activity. As a student calls out a number, point to it on the chart. When the next student says the next number, dramatically skip ahead two spaces on the chart and point to the new number. If you do this from the very beginning, the patterns should be clear before the more difficult numbers are reached.

When you have finished counting around the class, the number said by the last student should be the number on the Minicomputer, in our example, 56. If students notice this is the same number they calculated on the Minicomputer and want to comment, encourage them, but do not direct the discussion or insist on a full explanation. Instead, suggest lightly that the students think about this and what it might mean.

F71.2 Minicomputer Worksheets #2

CAPSULE LESSON SUMMARY

Practice reading and putting numbers on the Minicomputer.

MATERIALS

Teacher: None

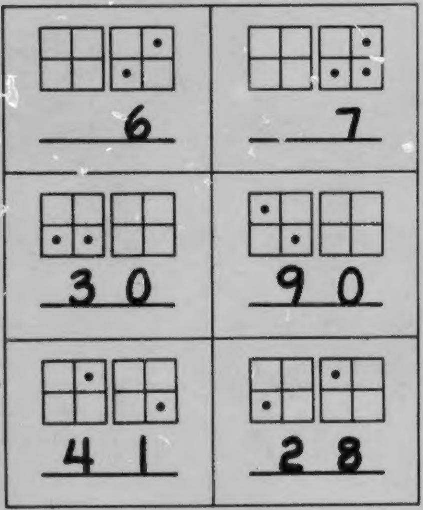
Student: Worksheets F71.2 *, **, and ***

DESCRIPTION OF LESSON

Distribute Worksheet F71.2 *. Students who finish F71.2 * should be given F71.2 **, and then F71.2 ***.

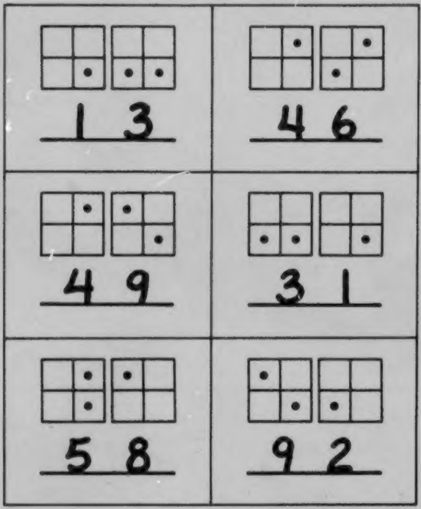
Name ____________ F 71.2 *

What number is on the Minicomputer?



6	7
30	90
41	28

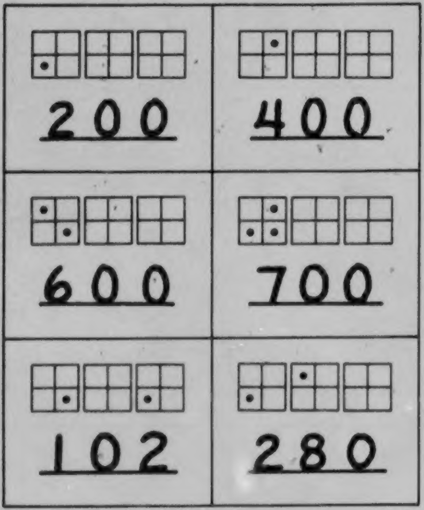
What number is on the Minicomputer ?



13	46
49	31
58	92

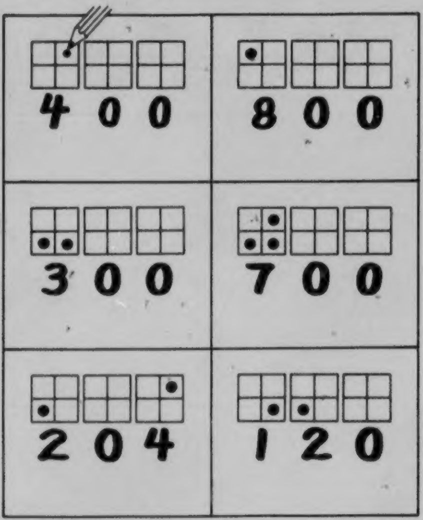
Name ____________ F 71.2 **

What number is on the Minicomputer?

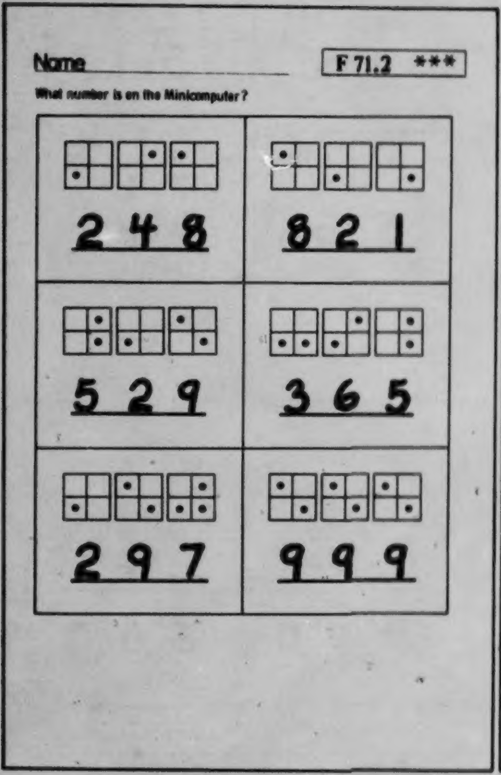


200	400
600	700
102	280

Put these numbers on the Minicomputer.



400	800
300	700
204	120

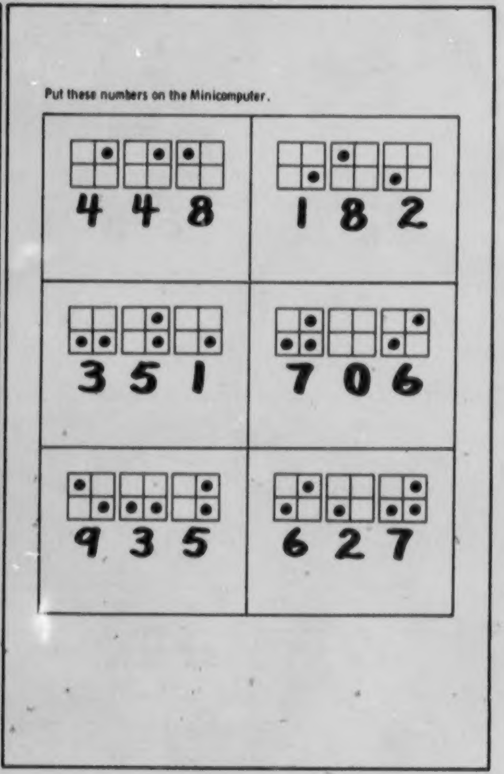


Name

F 71.2 ***

What number is on the Minicomputer?

2 4 8	8 2 1
5 2 9	3 6 5
2 9 7	9 9 9



Put these numbers on the Minicomputer.

4 4 8	1 8 2
3 5 1	7 0 6
9 3 5	6 2 7

F72.1 Multiplication Story #2

CAPSULE LESSON SUMMARY

Tell a story which poses the problem of calculating "5 x 7". Draw and use the Minicomputer to calculate "5 x 7".

MATERIALS

Teacher: Minicomputer set; calendar (if possible); colored chalk

Student: None

DESCRIPTION OF LESSON

Tell the following story or one similar to it. Choose one of your students to be the "star" of the story.

T: Penny is going to stay at her grandparents' farm this summer. What do you think Penny will do when she is at her grandparents' farm?

Allow the students a few minutes to discuss Penny's possible adventures.

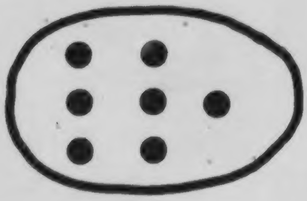
T: Penny will stay with her grandparents for five weeks. How many days are there in a week?

S: Seven.

You may wish to point out the days of the week on a calendar.

T: Let's draw a picture of the days in a week.

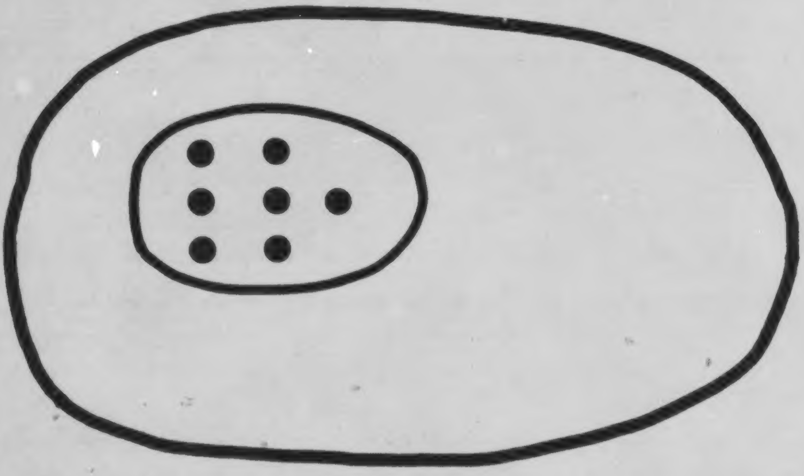
Draw this picture on the board.



F 72

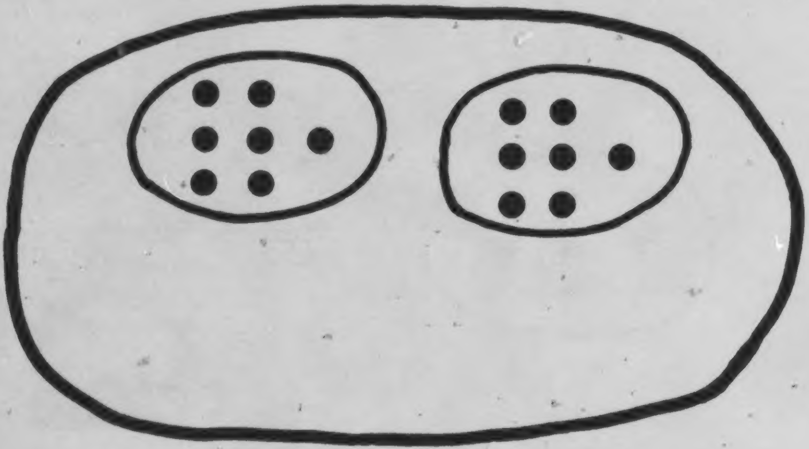
T: Each dot is for one day and all the days in one week are inside this string. How many dots are inside this string? (Seven)
How many weeks will Penny stay with her grandparents? (Five)
How many days, all together, will Penny stay with her grandparents?

Let students make some guesses and record them on the board, but do not affirm an answer yet. Then draw a large string on the board.



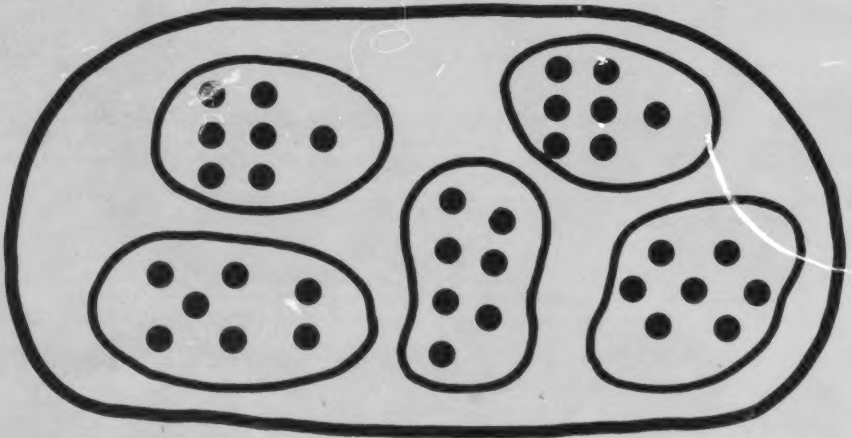
T: This string is for all the days Penny will stay with her grandparents.
How many weeks will Penny stay with her grandparents? (Five)
We have shown one week. Who can come show another week?

Ask a student to draw another string enclosing seven dots.



T: How many weeks have we shown so far? (Two)
How many days in these two weeks? (14)
How many more weeks need to be shown? (Three)

Send students to the board to complete the picture.



T: What number story can we write about this string picture?

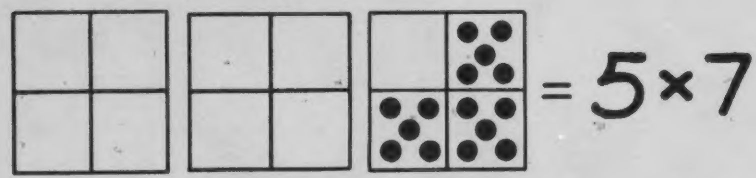
The class may suggest "7 + 7 + 7 + 7 + 7"; accept this and record it on the board, but ask for a shorter story. If no one suggests "5 × 7", hint at it by asking:

T: How many times did we write "7"?

Display three Minicomputer boards.

T: How could we do this calculation on the Minicomputer?

Allow the students to suggest that you put 7 on the Minicomputer five times. Then ask five students to each put 7 on the Minicomputer. Write "5 × 7" beside the Minicomputer.



F 72

Invite students to make plays until the standard configuration for 35 is obtained. Complete the one or more number stories on the board.

T : How many days will Penny stay with her grandparents ?

S : 35.

Determine the best guess and, if some students had guessed 35, ask them to explain how they found the answer. You may wish to suggest students count the dots in the string picture to ensure that there are, in fact, 35 of them.

F72.2 The Functions +2 and -2

CAPSULE LESSON SUMMARY

Label the dots and draw the return arrows in a +2 arrow picture.

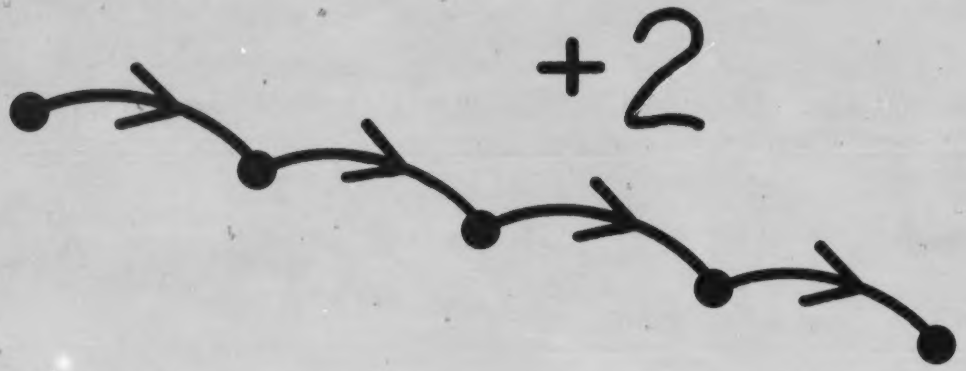
MATERIALS

Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



T: What are these red arrows for? (+2)

Point to the smallest number in this picture.

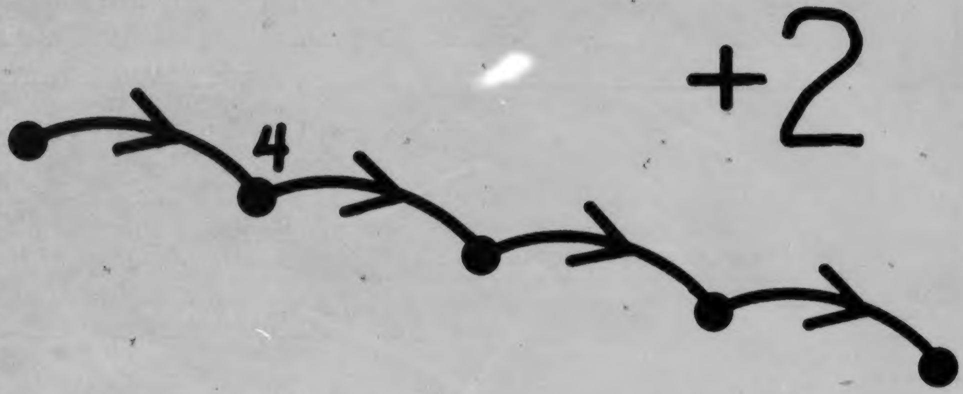
Point to the largest number in this picture.

Do you know which numbers are in my picture?

The students will probably suggest several numbers; ask them if they can know for sure that these numbers are in the arrow picture. Emphasize that the numbers in the picture are still unknown because none of the dots are labeled.

T: I will label one of the dots, and you can label the others.

Write "4" above the second dot from the left.



T: Who can label another dot for us?

A student will probably offer to label the dot for 6; the following dialogue assumes that this dot has been labeled.

T: How do you know this number is 6?

S: Because 4 + 2 = 6.

If necessary, help the student verbalize this. Emphasize how to read the arrow by pointing to the dot for 4 and then tracing the arrow to 6 as you repeat "4 + 2 = 6".

T: How did you know that 4 + 2 = 6?

Accept any correct method and demonstrate it to the class. Do not insist that a student be able to verbalize a method; simply invite another student who can, to explain a method.

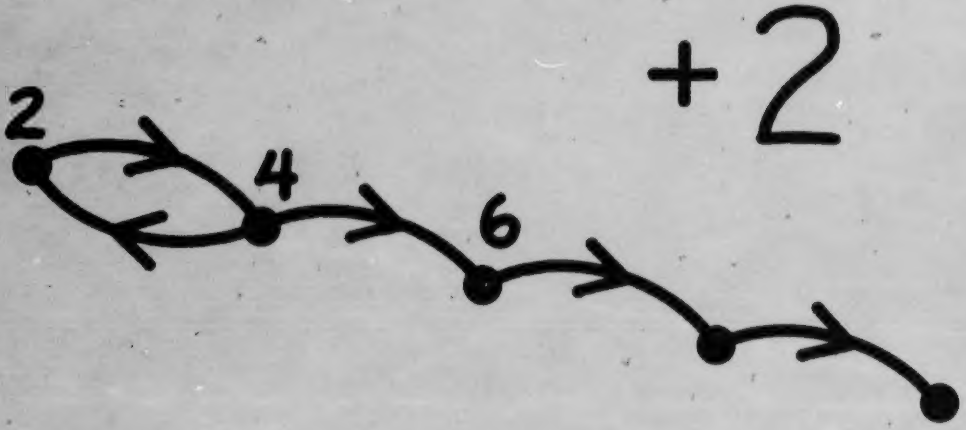
Continue in this manner until some student labels the dot for 2.

T: How do you know this number is 2?

S: Because 2 + 2 = 4.

S: Because 4 - 2 = 2.

Even if the second response is not given, draw a blue arrow from 4 to 2 in your picture.



T: What could this blue arrow be for?

S: -2.

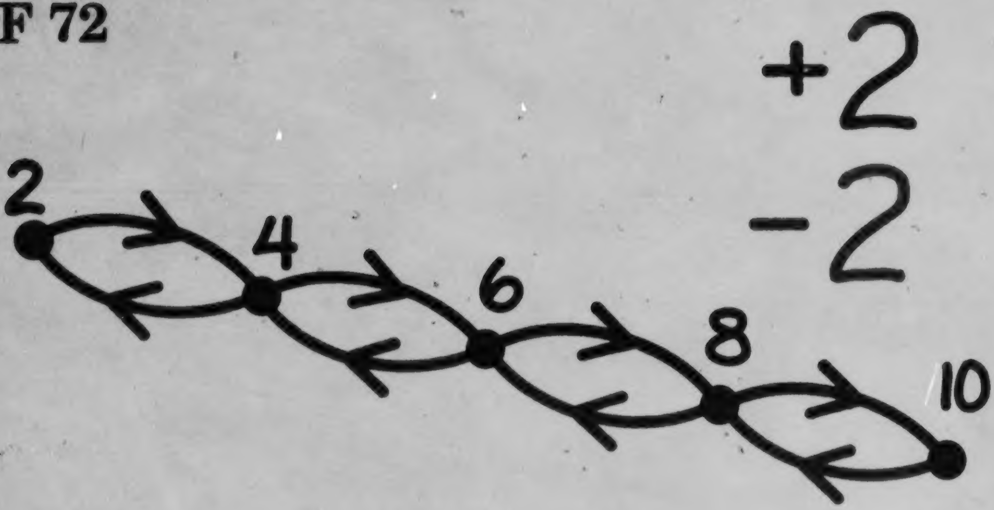
Write "-2" in blue near the arrow picture. Then start at 4 and trace the blue arrow from 4 to 2 as you say:

T: 4 - 2 = 2.
Could we draw any more -2 arrows in our arrow picture?

Ask students to trace each arrow and then draw the arrow yourself. After you draw an arrow, either ask the student to read the number story for this arrow or offer the number story yourself.

Continue in this manner until the arrow picture is complete.

F 72



T: If I continued to draw red arrows beyond 10, what other numbers would we meet?

Consider each number as it is suggested. Trace more red arrows on the board as necessary to determine whether you would meet a suggested number. For example, suppose that 15 has been suggested. Start at 10 and trace one arrow.

T: 10 + 2 = . . . ?

S: 12.

Trace another arrow.

T: 12 + 2 = . . . ?

S: 14.

Trace another arrow.

T: 14 + 2 = . . . ?

S: 16.

T: We passed 15 without meeting it. If we go on adding 2 will we ever meet 15?

Allow students to comment and observe that the numbers will get larger and larger as you continue to add 2, so you will never meet 15.

When it is impractical to check by tracing arrows, simply state whether the suggested number will or will not be met.

F 73

F73.1 Same First Initial #1

CAPSULE LESSON SUMMARY

Draw an arrow picture for the relation "I have the same first initial as you" where the dots are for students in the class.

MATERIALS

Teacher: Colored chalk

Student: None

IMPORTANT NOTE: This lesson and two others (F79.2 and S27.2*) all make use of groups of students who have first initials in common. Ideally, of course, your own students should "star" in these lessons; this requires that you identify several such groups among your students. One simple way to do this is to make a list, in alphabetical order according to your students' first names, circling each group of students who have the same first initial.

For each lesson it is suggested that three groups be used and the composition of these is described below.

F73.1:

- Two students with the same first initial (such as "G")
- Two students with (another) same first initial (such as "W")
- One student whose first initial is different from all the rest

F79.2:

- Three students with the same first initial (such as "R")
- Two students with the same first initial (such as "B")
- One student whose first initial is different from all the rest

S27.2:

- Six students with the same first initial (such as "M")
- Three students with the same first initial (such as "C")
- Two students with the same first initial (such as "T")

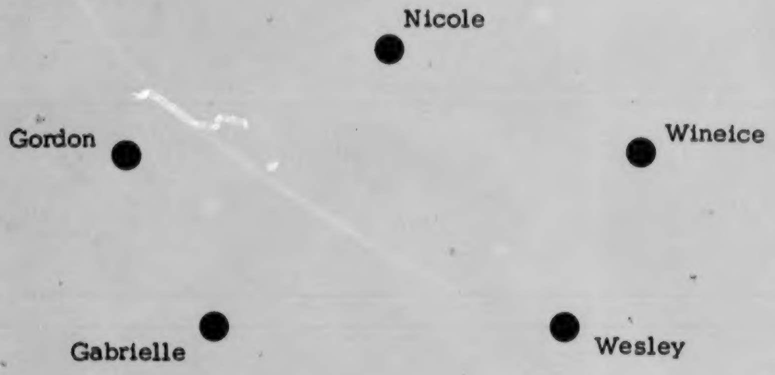
---

* This lesson is to be found in CSMP Mathematics for First Grade, Part II, Teacher's Guide.

The lesson descriptions are made with groups as described; however, you may find it necessary to adapt one or more of the lessons because you do not have groups with the suggested composition. Feel free to do so, but be careful not to choose a situation which becomes too complicated. Also, try to choose different groups for the lessons so that they are increasingly more interesting.

DESCRIPTION OF LESSON

Choose five students from your class so that two pairs each have the same first initial and one other student has a first initial different from anyone else. Call the students to the front of the room, draw a dot for each of them and label the dots. (Of course, in your picture the names will be of students in your class.)



Tell one student who shares a first initial with another student to point to everyone in this group of five with the same first initial. (It may be necessary to explain that a "first initial" is the first letter of one's first name.) When, for example, Gabrielle points to Gordon, draw an arrow from Gabrielle's dot to Gordon's dot.

T: Gabrielle can say to Gordon, "I have the same first initial as you."

Ask the other students in the group to do the same. Draw, or ask members of the class to draw, the appropriate arrows as the students point. If no one realizes that a student can point to himself or herself, hint at this fact.

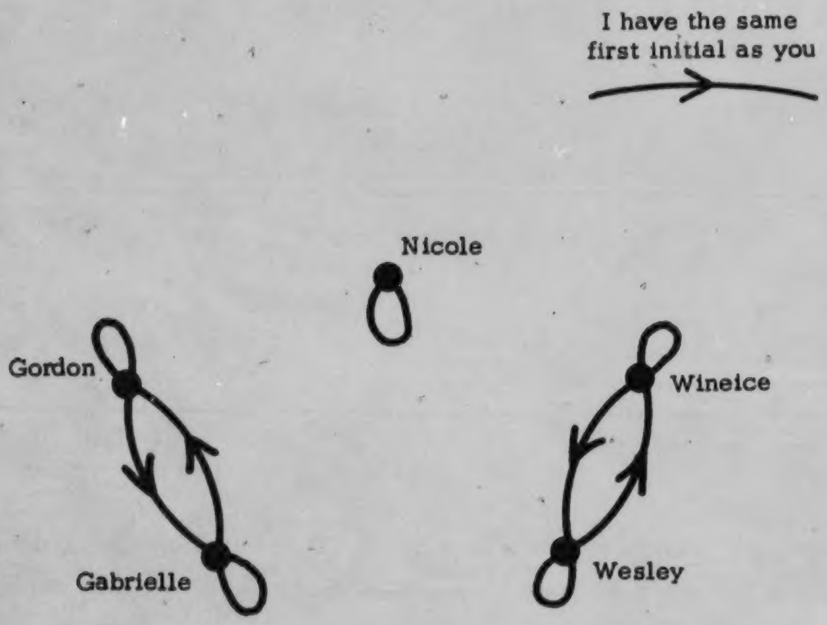
F 73

T: Nicole, you can point to someone in this group of five students. Who is it?

Nicole, point to everyone in this group of five students whose first name begins with "N".

Gabrielle, isn't there someone else among the five of you to whom you can point?

When the students suggest that each person can point to himself or herself, add loops to the picture.


I have the same first initial as you
Nicole
Gordon
Wineice
Gabrielle
Wesley

F73.2 A Parade of Problems #1

CAPSULE LESSON SUMMARY

Provide individual practice with the Minicomputer, arrow pictures, counting problems, string pictures, and so on.

MATERIALS

Teacher: None

Student: "Parade of Problems #1" workbook; colored pens, pencils, or crayons

DESCRIPTION OF LESSON

Distribute copies of "Parade of Problems #1" and let students work at their own rates. Circulate among the class to give help where needed. Encourage students to be careful and check their work.

Allow about twenty minutes for this independent work. Because the pages of the workbook increase in difficulty as the students progress through them, some students will naturally complete more pages than will others. We have deliberately provided enough exercises so that even your brightest students will remain challenged.

A second lesson is scheduled for these workbooks. When the period is over, collect the workbooks and indicate, on the cover, those pages which are correct and those which should be corrected by the students when the books are used again (Lesson S6.2).*

---

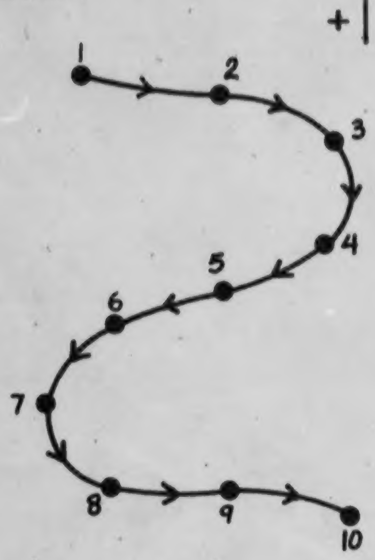
* This lesson is to be found in CSMP Mathematics for First Grade, Part II, Teacher's Guide.

A Parade of Problems 1

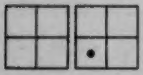
Count by ones.

1	2	3	4	5	6	7	8	9
2	3	4	5	6	7	8	9	10
3	4	5	6	7	8	9	10	
4	5	6	7	8	9	10		
5	6	7	8	9	10			
1	2	3	4	5				
2	3	4	5	6	7	8	9	10

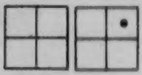
Label the dots.


+1
1
2
3
4
5
6
7
8
9
10

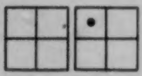
What number is on the Minicomputer ?



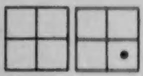
2



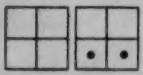
4



8



1



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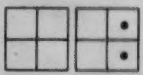
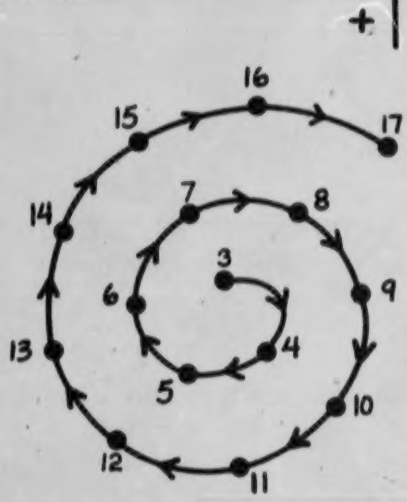


5

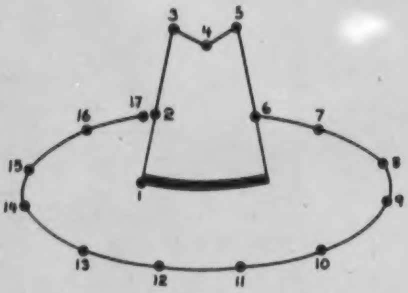
Label the dots.


+1
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

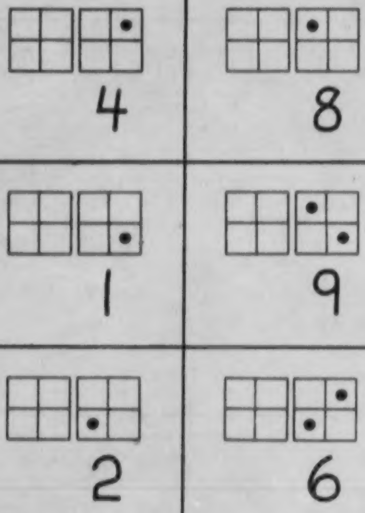
How much money?

(1¢) (1¢) (1¢)	3¢
(1¢) (1¢) (1¢) (1¢)	4¢
(5¢)	5¢
(5¢) (1¢)	6¢
(5¢) (1¢) (1¢) (1¢)	8¢

Connect the dots in order.

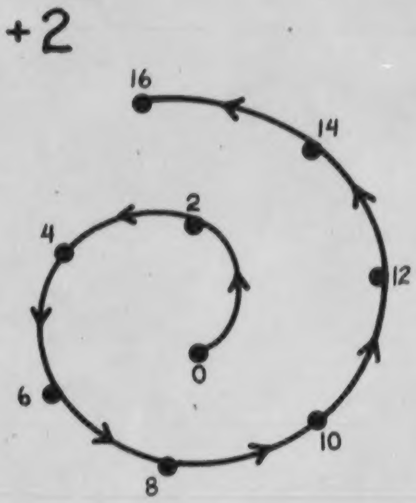

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17

Put the numbers on the Minicomputer.

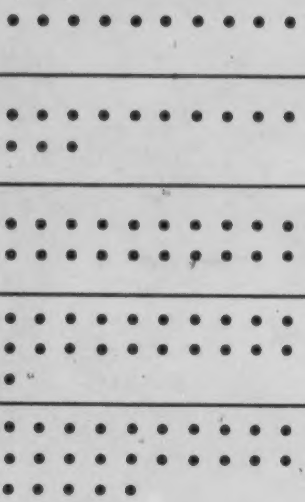


(Many answers are possible.)

Label the dots.


+2
0
2
4
6
8
10
12
14
16

How many dots ?



10

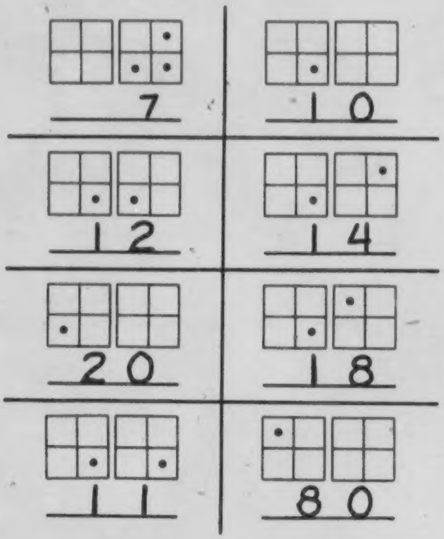
13

20

21

25

What number is on the Minicomputer ?



7

10

12

14

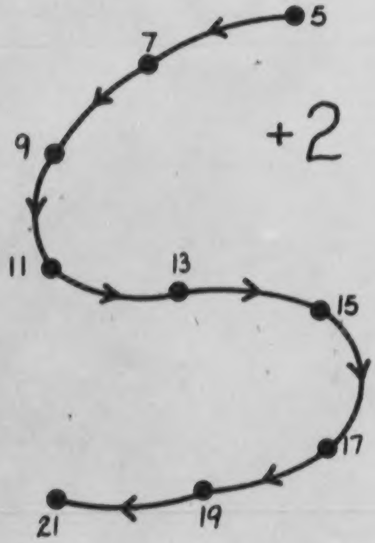
20

18

11

80

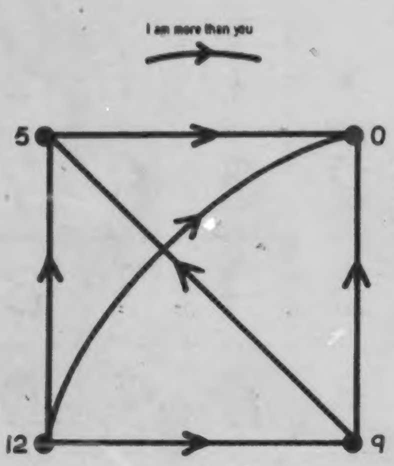
Label the dots.



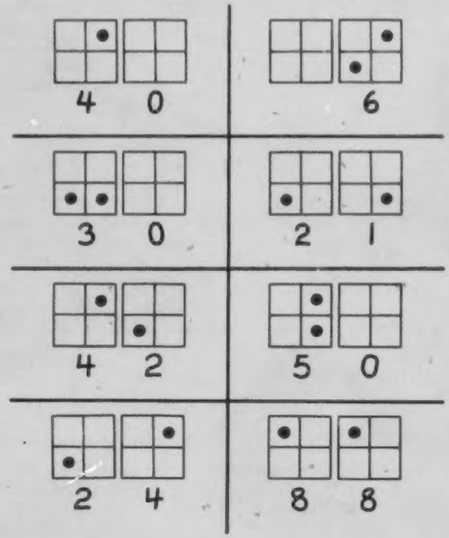
Complete this numeral chart.

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99
100	101	102	103	104	105	106	107	108	109

Draw all the missing red arrows.


I am more than you
5
0
12
9

Put the number on the Minicomputer.

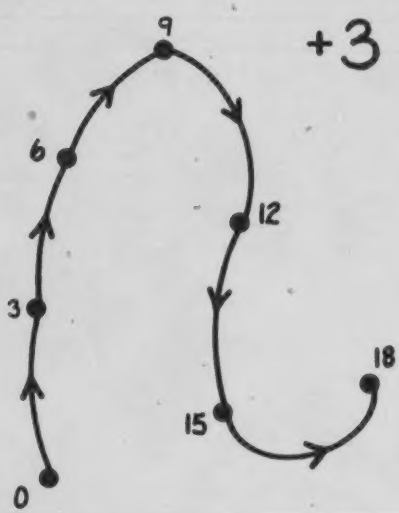

4 0
6
3 0
2 1
4 2
5 0
2 4
8 8

(Many answers are possible.)

Write < or = or > . The first one is done for you.

2 + 1	<	4
3 + 2	>	4
1 + 4	=	5
3 + 3	>	5
2 + 4	=	6
4 + 1	<	6
4 + 4	>	7
1 + 6	=	7
5 + 5	>	8

Label the dots.


+3
0
3
6
9
12
15
18

How much money?

(10¢)(1¢)(1¢) 12¢

(10¢)(1¢)(1¢)(1¢)(1¢)(1¢) 15¢

(10¢)(1¢)(1¢)(1¢) 13¢

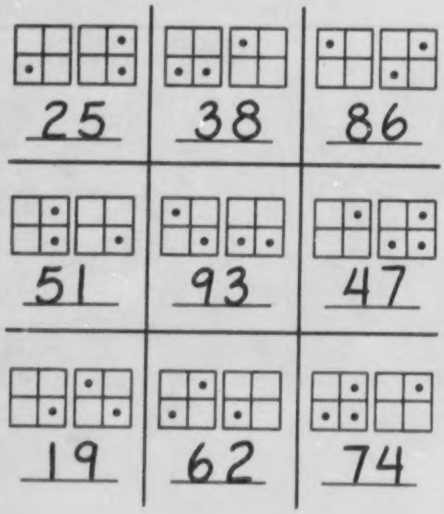
(10¢)(1¢) 11¢

(10¢)(1¢)(1¢)(1¢)(1¢) 14¢

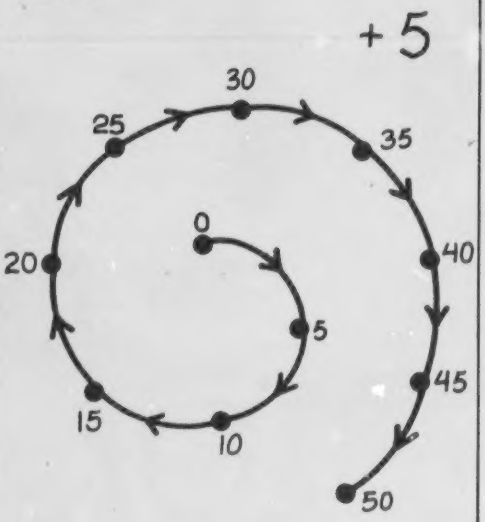
Complete the table.

+	1	4	5
2	3	6	7
3	4	7	8
5	6	9	10

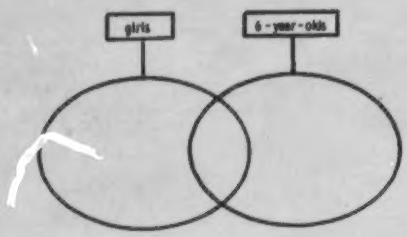
What number is on the Minicomputer?


25
38
86
51
93
47
19
62
74

Label the dots.


+5
0
5
10
15
20
25
30
35
40
45
50

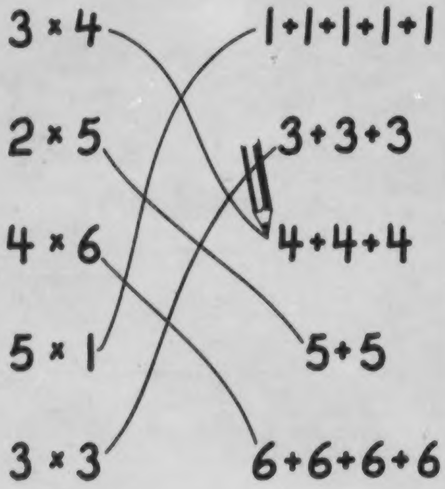
Draw a dot for yourself.


girls
6-year-olds

22

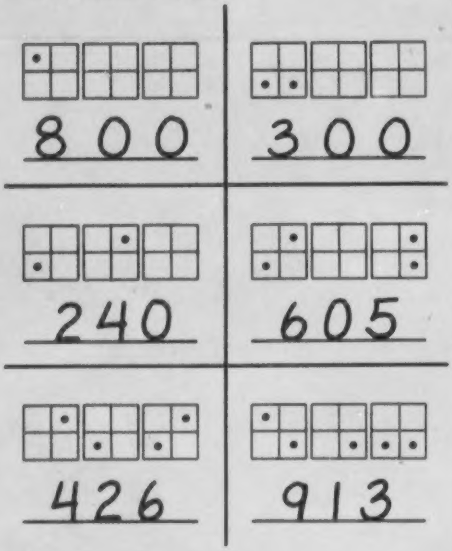
(Answers will vary.)

Match.


3 × 4
2 × 5
4 × 6
5 × 1
3 × 3
1+1+1+1+1
3+3+3
4+4+4
5+5
6+6+6+6

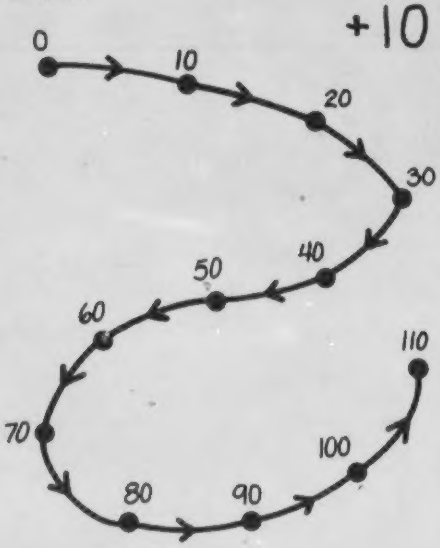
23

What number is on the Minicomputer ?


800
300
240
605
426
913

24

Label the dots.


+10
0
10
20
30
40
50
60
70
80
90
100
110

25

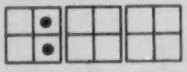
How much money?

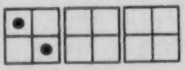
10¢ 10¢ 10¢ 10¢	40¢
5¢ 5¢ 5¢	15¢
5¢ 5¢ 1¢	11¢
10¢ 5¢ 1¢ 1¢	17¢
10¢ 10¢ 5¢	25¢
10¢ 5¢ 5¢	20¢

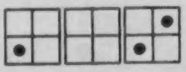
Write < or > or =.

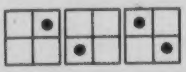
3 + 4	=	5 + 2
5 + 3	<	6 + 3
13 + 7	>	12 + 7
19 + 14	=	18 + 15
9 + 6	>	10 + 4
2 × 10	<	3 × 10
175 + 1	<	175 + 2
2 × 3	=	3 × 2

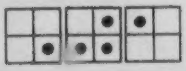
Put the numbers on the Minicomputer.

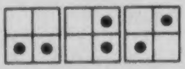

5 0 0


9 0 0


2 0 6

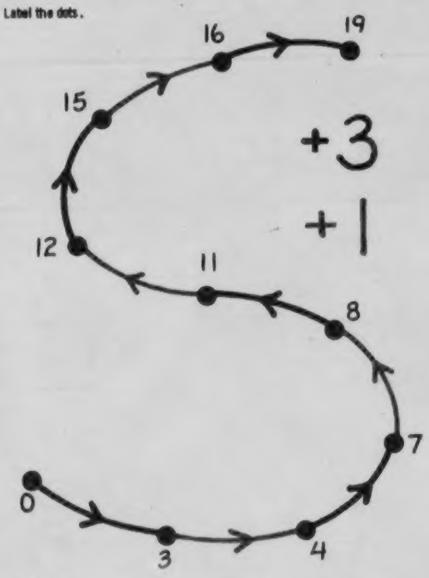

4 2 9

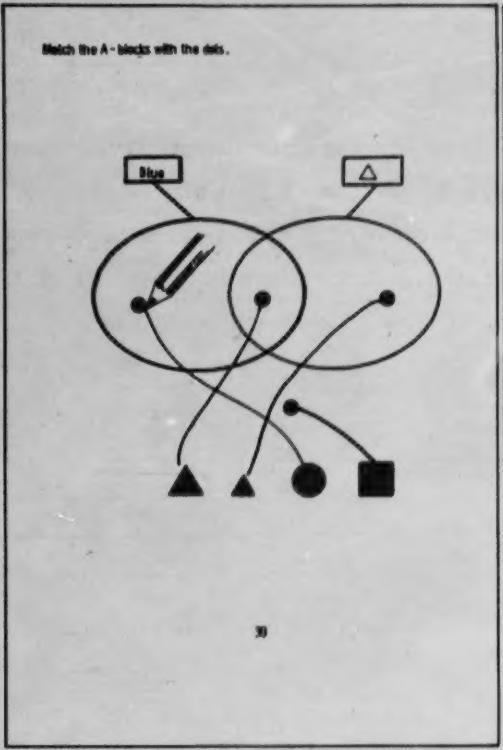

1 7 8


3 5 6

(Many answers are possible.)

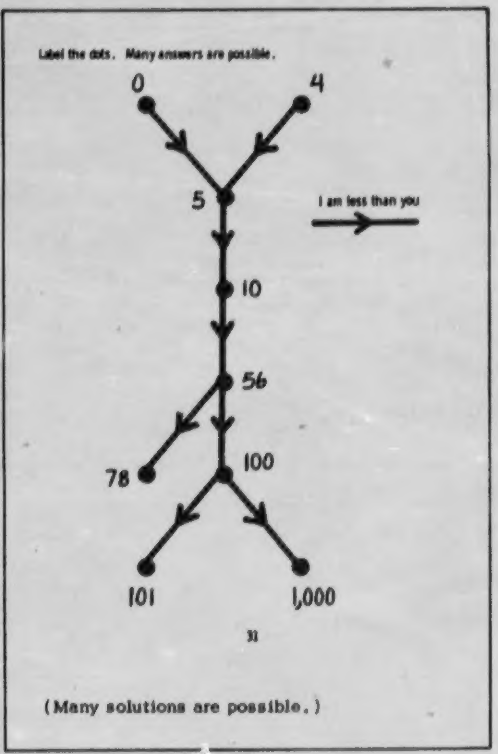
Label the dots.





Match the A-blocks with the dots.

30

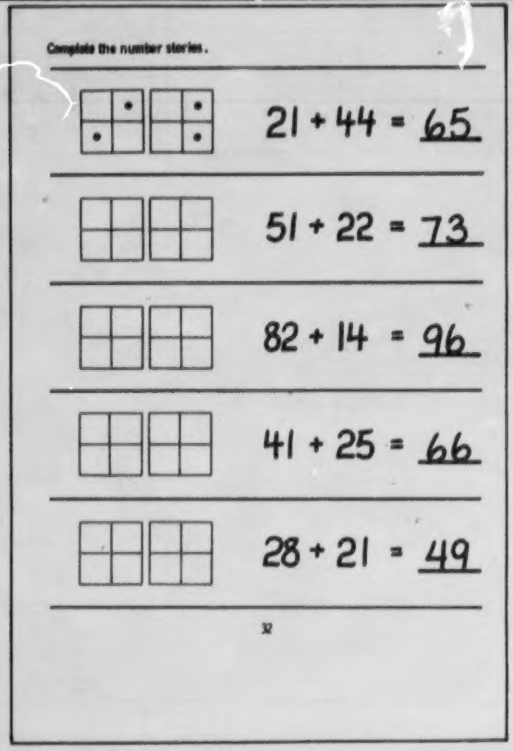


Label the dots. Many answers are possible.

0
4
5
I am less than you
10
56
78
100
101
1,000

31

(Many solutions are possible.)



Complete the number stories.

21 + 44 = 65

51 + 22 = 73

82 + 14 = 96

41 + 25 = 66

28 + 21 = 49

32

F 74

F74.1 Transforming a Number

CAPSULE LESSON SUMMARY

Estimate a number which has been put on the Minicomputer with many checkers. Move checkers in various ways each time observing whether the move changes the number (smaller or larger) or leaves the same number on the Minicomputer. Make plays to decide which number is on the Minicomputer and compare this to the estimates.

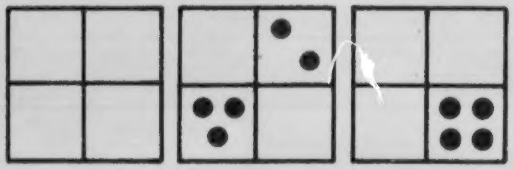
MATERIALS

Teacher: Minicomputer set

Student: None

DESCRIPTION OF LESSON

Put this configuration (using the three different colors of checkers) on your Minicomputer.



T: What number is on the Minicomputer?

Students will probably suggest making some plays before telling you what this number is.

T: Yes, the number would be easier to read if we made some plays, but could we estimate it without making any plays?

If necessary, explain that "to estimate" means to make a close guess.

T: Is this number more than 10? (Yes)
How do you know?

S (pointing to a checker on the 40 - square): Because this is 40 and 40 is more than 10.

T: Is the number more than 40? (Yes)
How do you know?

S: Because there are two 40's.

T: Is the number more than 100? (Yes)
How do you know?

S (pointing to two checkers on the 40 - square and one checker on the 20 - square): Here is 100 and there are still more checkers.

If students do not make this or another appropriate observation, do not continue; say simply that they are not certain whether or not the number is more than 100.

T: Watch very carefully; I am going to do something. You must tell me if I change the number, or if the number remains the same.

Very obviously, move a checker from the 1 - square to the 10 - square.

T: Did I change the number?

S: Yes.

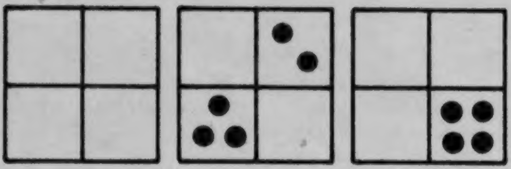
T: Is the new number more or less than before? Why?

S: More, because you moved from 1 to 10.

T: Very good. Let's return to the original number. What should I do?

S: Move the checker from the 10 - square to the 1 - square.

After returning the checker to its original position, ask the students to again watch carefully. Replace one of the checkers on the 20 - square with a checker of another color.



T: Did I change the number? (No) Why not?

S: You only changed the color of the checker.

T: Yes; I can change the color of a checker without changing the number.

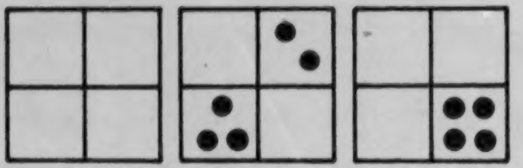
Write these three words on the board:

LARGER SAME SMALLER

Tell the students that this time, instead of saying aloud whether you change the number, they should simply raise their hands when you point to the word which describes the number after your movement(s).

Very obviously, move a checker from the 40 - square to the 4 - square. Point to to each of the three words on the board and ask the students to raise their hands when you point to the appropriate word. If necessary, repeat the move very slowly and deliberately to give students another opportunity to tell you about the number. Ask a student who knows that the new number is smaller to explain why.

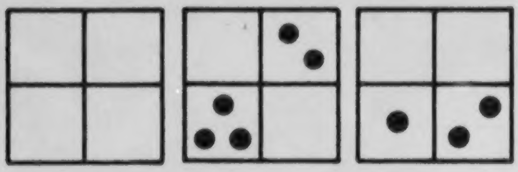
T: When I move a checker from the 40 - square to the 4 - square, I change the number; so I'll move this checker back to the 40 - square.



Make a "1 + 1 = 2" play as obviously as possible and then point to each word, as before. If many students believe incorrectly that you changed the number, return the two checkers to the 1 - square and repeat the play, giving the class another opportunity to tell you about the "new" number.

Ask a student who realizes that the number is the same to explain why.

T: The play I made didn't change the number, so I will just leave the checkers as they are.



Continue this activity using the following suggested movements. Whenever a movement changes the number, be sure to return the checkers to their previous configuration before continuing.

- Move a checker from the 20 - square to the 10 - square. (Smaller)
- Move both checkers on the 40 - square to the 80 - square. (Larger)
- Move the checker on the 2 - square to another position on the 2 - square. (Same)
- Make a "20 = 10 + 10" backward play. (Same)

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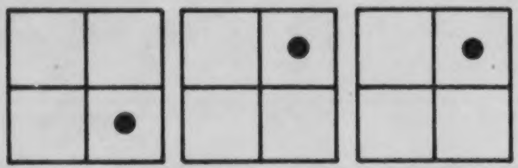
T: Do we still have the number we started with? (Yes)
We've moved some of the checkers, but we haven't changed the number. What did we estimate this number to be?

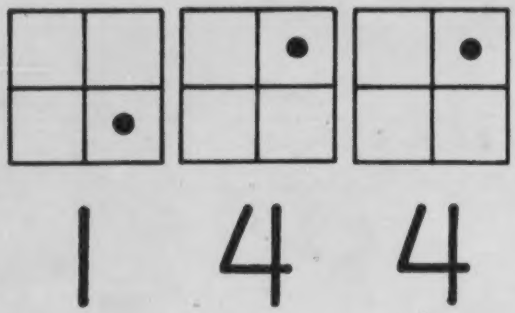
Your class may have estimated the number to be more than 100 or they may have been uncertain. Allow the students to guess or estimate which number is on the Minicomputer and record their guesses (or estimates) on the board.

T: Let's make some plays now so the number is easier to read.
Be sure that in making your plays, you don't change the number.

Students should be able to make the plays fairly easily, but it may be necessary to suggest the "80 + 20 = 100" play yourself. This is the standard configuration which should be obtained.



Invite a student to read the number and another to write the numerals below the Minicomputer.



Review the guesses you have recorded on the board and determine which was the best estimate.

F74.2 Addition Problem #8

CAPSULE LESSON SUMMARY

Present several addition calculations in a story situation. Do the calculations on the individual Minicomputers and write number stories for these addition problems.

MATERIALS

Teacher: Minicomputer set

Student: Minicomputer set; Worksheets F74.2 *, **, and ***

DESCRIPTION OF LESSON

Display two demonstration Minicomputer boards. Each student will need two individual Minicomputer boards (one sheet) and several checkers. Tell the following story or one you think would be more appropriate for your class.

T: Barry entered a hot dog-eating contest. To win the prize, he must eat as many hot dogs as he can. Each time he finishes one plate of hot dogs, the judge brings out another plate.

You may wish to let the class discuss this story briefly.

T: The first plate had six hot dogs on it. Put 6 on your Minicomputers.

Ask one student to also put 6 on the demonstration Minicomputer. Be sure all students have 6 on their Minicomputers before continuing. Some students may have non-standard configurations for 6 on their Minicomputers; accept these, but do not encourage the use of non-standard configurations during this lesson.

T: The second plate had ten hot dogs on it. Add 10 to your Minicomputers.

Ask a student to add 10 to the demonstration Minicomputer.

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T: How many hot dogs were on the first plate?

S: Six.

T: How many hot dogs were on the second plate?

S: Ten.

Write the calculation on the board.

$$6 + 10 =$$

T: How many hot dogs will Barry have eaten if he finishes the second plate?

S: 16.

Complete your number story on the board.

$$6 + 10 = 16$$

T: Barry finished the second plate of hot dogs, so the judge brought him a third plate; but Barry was so full that he could only eat one more hot dog. Add 1 to the 16 on your Minicomputers.

Ask a student to add 1 to the demonstration Minicomputer.

T: How many hot dogs did Barry eat all together?

S: 17.

T: Here are some number stories we can write.

$$16 + 1 = 17$$

or

$$6 + 10 + 1 = 17$$

Remove all checkers from the demonstration Minicomputer and ask the students to remove the checkers from their Minicomputers.

T: Barry's friend Jimmy also entered the contest. The first plate brought to Jimmy had five hot dogs on it. Put 5 on your Minicomputers.

Ask a student to put 5 on the demonstration Minicomputer.

T: His second plate had four hot dogs. Add 4 to your Minicomputers.

Ask a student to add 4 to the demonstration Minicomputer.

T: How many hot dogs were on Jimmy's first plate?

S: Five.

T: How many hot dogs were on Jimmy's second plate?

S: Four.

Write the calculation on the board.

$$5 + 4 =$$

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T: How many hot dogs will Jimmy have eaten if he finishes both plates?

S: Nine.

The students may suggest making a play; if so, ask a student to tell you which play should be made. The students who have not yet made the play should watch you make the play, so they can make the play on their own Minicomputers. As dramatically as possible, make the "4 + 4 = 8" play.

Before continuing, check that all the students have 9 on their Minicomputers.

T: The judge brought Jimmy a third plate of six hot dots, and Jimmy ate all six. Add 6 to your Minicomputers.

Ask a student to add 6 to the demonstration Minicomputer.

Let students suggest making the "8 + 2 = 10" play. Demonstrate the play as before and check that students make the play on their Minicomputers. The class should find that 15 is on their Minicomputers.

T: What number stories can we write?

$$5+4+6=15$$

or

$$9+6=15$$

T: So far, Jimmy has eaten 15 hot dogs. The judge brought Jimmy another plate of hot dogs, but Jimmy couldn't eat any of them. Who ate more hot dogs, Barry or Jimmy? (Barry)

On the board, you may wish to record the names of these two children and the number of hot dogs each one ate.

Barry : 17
Jimmy : 15

Remove all checkers from the Minicomputers.

T: Jimmy's sister, Lisa, also entered the hot dog-eating contest. The first plate brought to her had seven hot dogs on it. Put 7 on your Minicomputers.

Ask a student to put 7 on the demonstration Minicomputer.

T: The second plate the judge brought to Lisa had eight hot dots on it. Add 8 to your Minicomputers.

Ask a student to add 8 to the demonstration Minicomputer. At this point, the students will probably suggest making a play.

T: What play shall we make?

S: "8 + 2 = 10".

Demonstrate the play as you did earlier, and check that the students make the play on their Minicomputers.

T: What number story can we write?

S: 7 + 8 = 15

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T: Lisa ate all the 15 hot dogs on her first two plates, so the judge brought her a third plate of hot dogs. Lisa tried very hard, but she could only eat one more hot dog. Add 1 to the number on your Minicomputers.

Ask a student to add 1 to the demonstration Minicomputer.

T: Should we make a play? (Yes) What play should we make?

S: "1 + 1 = 2".

Make this play as obviously as possible and check that the students make the play correctly on their Minicomputers.

T: What number stories can we write?

$$15+1=16$$

or

$$7+9+1=16$$

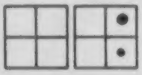
T: Who ate the most hot dogs? (Barry)
Who ate the fewest hot dogs? (Jimmy)

Worksheets F74.2*, **, and *** are available for the remainder of the period. Explain to the students that the first number in the number story is already on each Minicomputer. They should draw the checkers for the second number, and complete the number story. (Do not insist that the students draw the checkers, if they can answer correctly without doing so.)

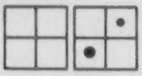
Name ____________________ F 74.2 *

Complete:

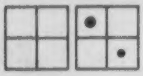
1+4 = 5



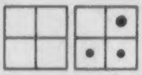
4+2 = 6



1+8 = 9

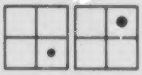


3+4 = 7

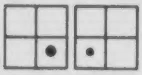


Complete.

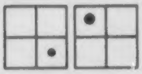
10+4 = 14



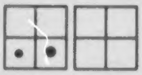
2+10 = 12



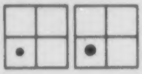
10+8 = 18



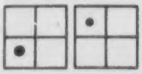
20+10 = 30



20+2 = 22

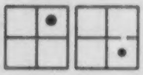


8+20 = 28

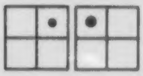


Name ____________________ F 74.2 **

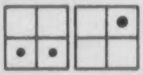
Complete:



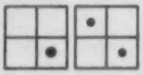
1 + 40 = 41



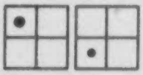
40 + 8 = 48



30 + 4 = 34

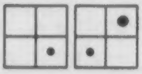


9 + 10 = 19

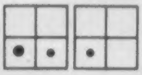


2 + 80 = 82

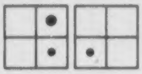
(Continue on the back.)



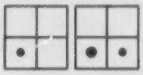
12 + 4 = 16



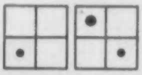
12 + 20 = 32



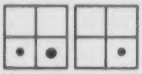
12 + 40 = 52



21 + 2 = 23



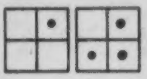
21 + 8 = 29

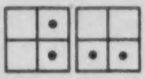


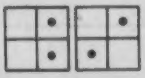
21 + 10 = 31

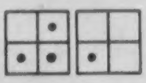
Name ______________ F 74.2 ***

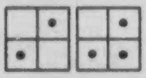
Complete:


42+5 = 47

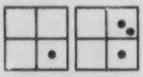

42+11 = 53

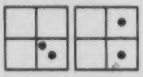

42+14 = 56

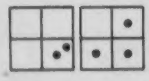

42+30 = 72

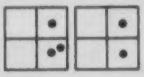

42+25 = 67

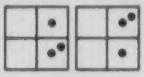
(Continue on the back.)

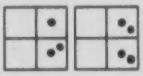

15+4 = 19


15+10 = 25


15+12 = 27


15+50 = 65


15+54 = 69


15+55 = 70

F75 Tina Visits the Library

CAPSULE LESSON SUMMARY

Use a story situation to draw a string picture, to write number stories and to draw paths between two points on a grid board.

MATERIALS

Teacher:	Colored chalk; grid board
Student:	Colored pencils, Worksheet F75

DESCRIPTION OF LESSON

Exercise 1

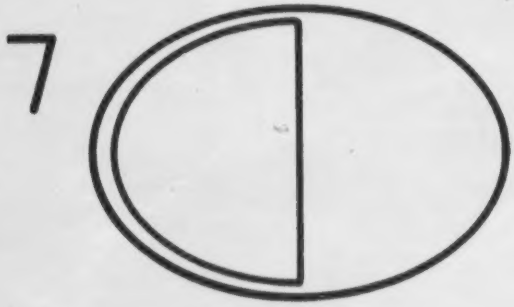
Tell the class a story about a girl named Tina who often goes to the library to check out some books. She always checks out seven books because that is as many as the library will allow. Tina only likes two kinds of books, so she only checks out books about cowboys or dinosaurs. Today Tina checked out five books about cowboys.

Draw a large string on the board.

T: All the books Tina got from the library today are in this string. How many books did Tina get from the library?

S: Seven.

Write "7" near the string, and draw a second string inside the first one (use a different color, such as red, for this second string.

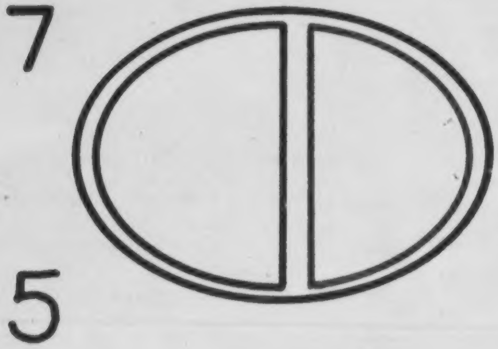


F 75

T: Tina's cowboy books are in the red string. How many books about cowboys did she check out?

S: Five.

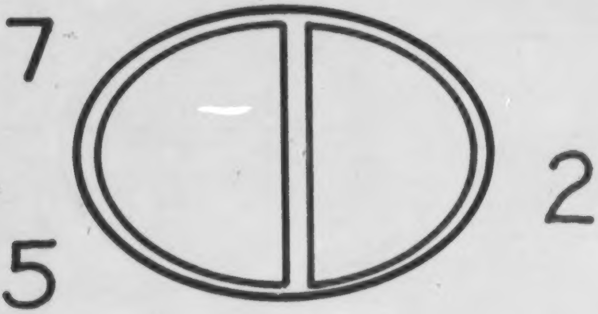
In red, write "5" near the red string. Draw a third string in another color, such as blue, as illustrated.



T: The books about dinosaurs are in the blue string. Who can tell us how many books about dinosaurs Tina has checked out? How do you know?

S: Two, because 7 - 5 = 2 (or 5 + 2 = 7).

Record whatever number story is suggested by the students' answer. In blue, write "2" near the blue string.



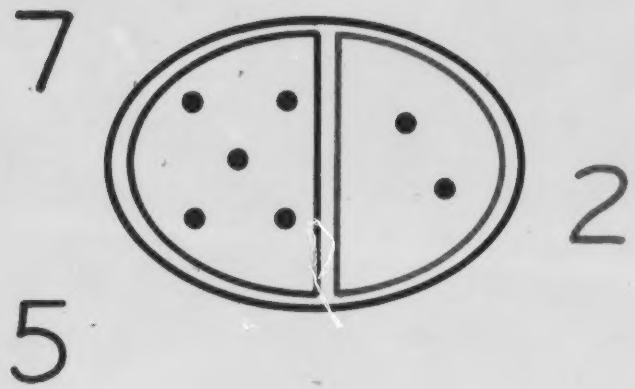
T: Can anyone tell us another number story about this picture?

Continue to invite number stories until the four listed below are suggested. You may need to suggest the subtraction number stories yourself.

$5+2=7$ $7-2=5$

$2+5=7$ $7-5=2$

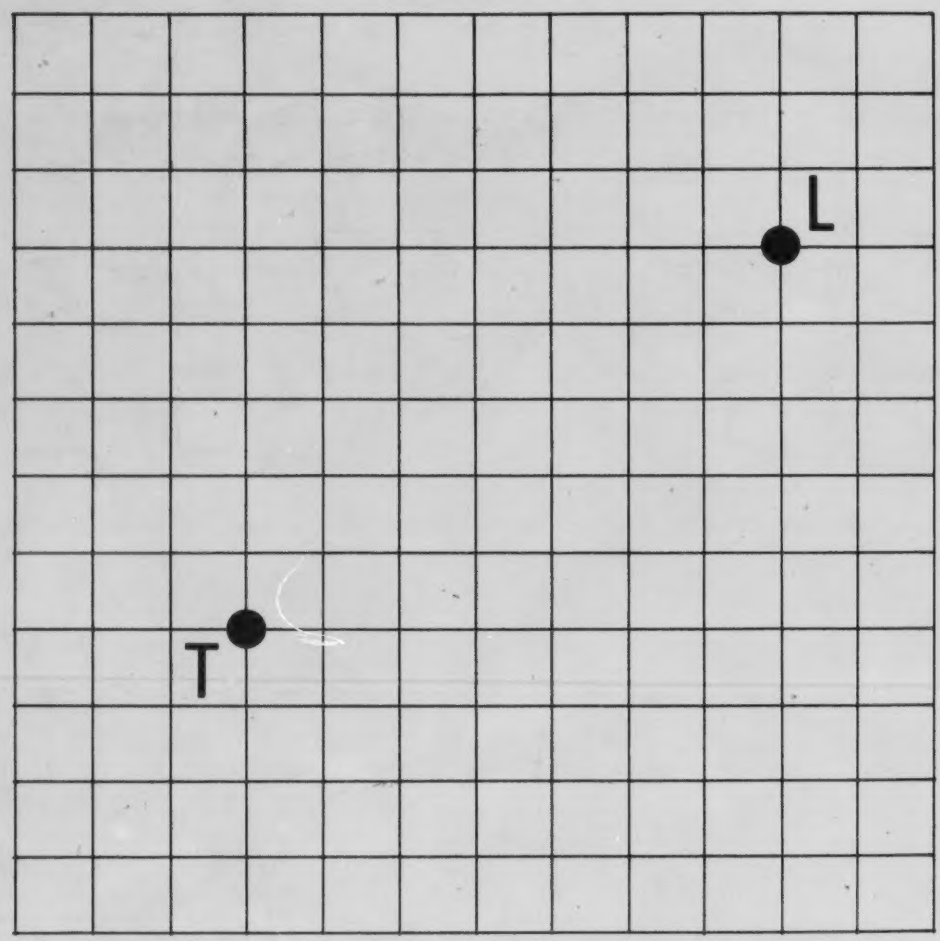
Ask a student to draw dots in the string picture for the books Tina got from the library.



Exercise 2

On a grid board, draw and label two dots as illustrated.

F 75



T : This is a map of the city where Tina lives. Who can show us where Tina lives? (The dot labeled "T")
Who can show us where the library is? (The dot labeled "L")

Moving your finger along one of the lines, explain to the students that the lines on the grid are the streets of Tina's city.

T : When Tina walks to the library she always walks along the streets, because she knows it is not polite to walk across the yards of other people.

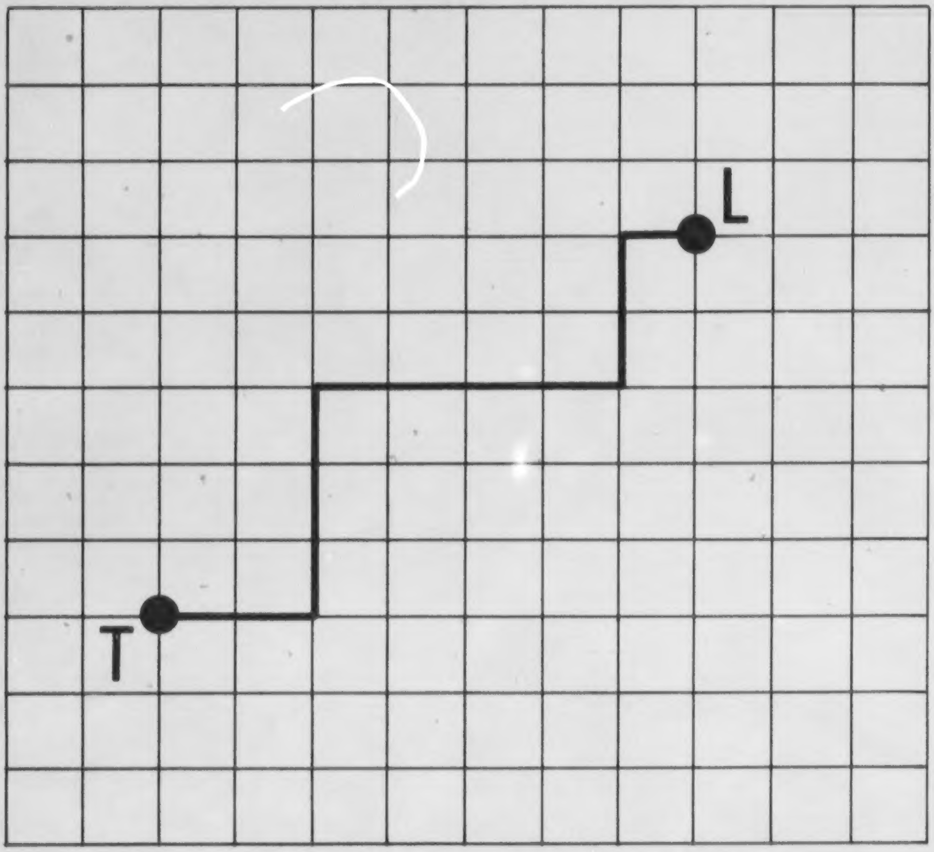
Ask a student to show a path from T to L using a pointer or finger. Accept any path which follows the lines. Be prepared to repeat the explanation, if necessary, that the lines of the grid board are the streets of the town. Ask one or two additional students to trace paths on the "map".

T: Sometimes, when it is a very nice day, Tina takes a long path to the library. Who would like to show us a path Tina could take on a nice day?

Ask one or two students to trace such long paths on the grid board.

T: One day it was raining, so Tina took a short path to the library. Who can show us a path Tina could take on a rainy day?

Accept any path which is relatively short and follows the streets. If the path is correctly traced, draw it on the grid board. One such path is shown below.



F 75

Distribute a copy of Worksheet F75 and some colored pencils to each student. Ask the students to draw paths from Tina's house to the library; they should use a different color for each path they draw. Remind them that they must follow the streets.

As the students work on this problem, walk around the classroom observing them. Allow enough time for them to be free and original in finding interesting paths. When students have drawn several paths, you can ask them to turn their sheets over and continue on the reverse side. Ask a few students to copy one of their paths on the grid board. Try to obtain paths which vary in length, and go through many different areas of the grid. Have each student use a different color of chalk.

After some time (perhaps about ten minutes), call the students' attention to the paths which have been drawn on the grid board.

T: Here we have several paths which Tina could take to the library. Which path do you think is the longest?

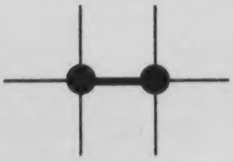
It is possible that your class will not agree on which of the paths is the longest. Do not insist on a concensus.

T: Why do you think this path is the longest?

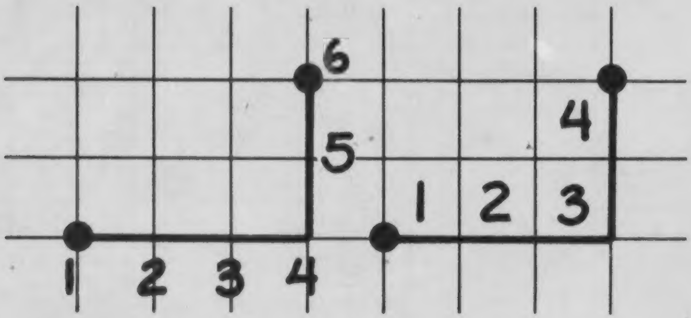
The students will probably say that a certain path "looks" longer. If one of them suggests counting blocks, accept this suggestion and aid in comparing the paths.

If no one makes this suggestion do not suggest it yourself.

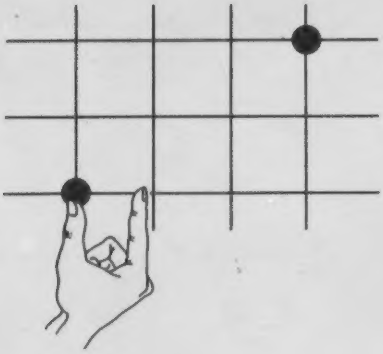
NOTE: Here is one block



Some very common mistakes are likely to occur when students count the blocks in a path, especially if the path turns a corner. For instance,

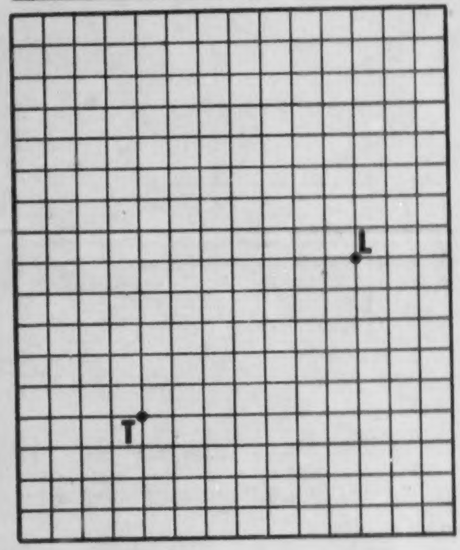


These paths are, in fact, both five blocks long. To avoid such mistakes, it may be helpful to ask your students to show the blocks with their thumb and index finger as they count them. This is illustrated below.

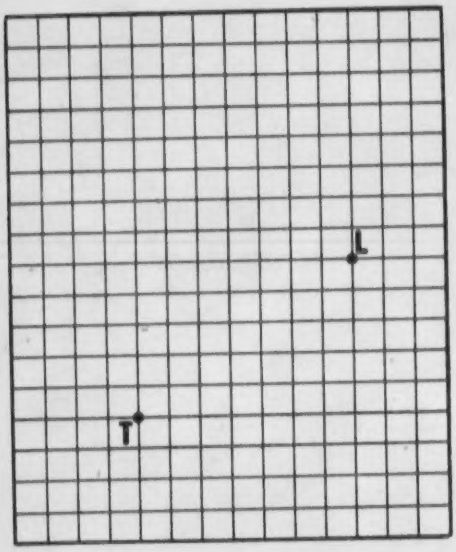


544

Name ____________ F 75



(Many solutions are possible.)



(Many solutions are possible.)

F76 Addition Problem #9

CAPSULE LESSON SUMMARY

Do the addition calculation "64 + 25" on individual Minicomputers and write the number story for this addition problem.

MATERIALS

Teacher: Minicomputer set

Student: Minicomputer set

DESCRIPTION OF LESSON

Begin by spending about ten minutes on a mental arithmetic activity.

T: Who knows what number is 2 + 3 ?

S: 5.

T: Right. 3 (hold up three fingers of one hand) plus 2 (hold up two fingers of the other hand) is 5 (bring the raised fingers of your two hands together). Who knows what number is 4 + 2 ?

S: 6.

T: Right. 4 (point to "4" on the number line) plus 2 (move two places to the right) is 6 (stop at "6" on the number line).

Continue to ask for the sums of two numbers. Choose problems of varying difficulty appropriate for your class. Check the answers, alternately, by the two suggested methods.

To check a sum which exceeds 10, you will need to use the number line method or a different finger method.

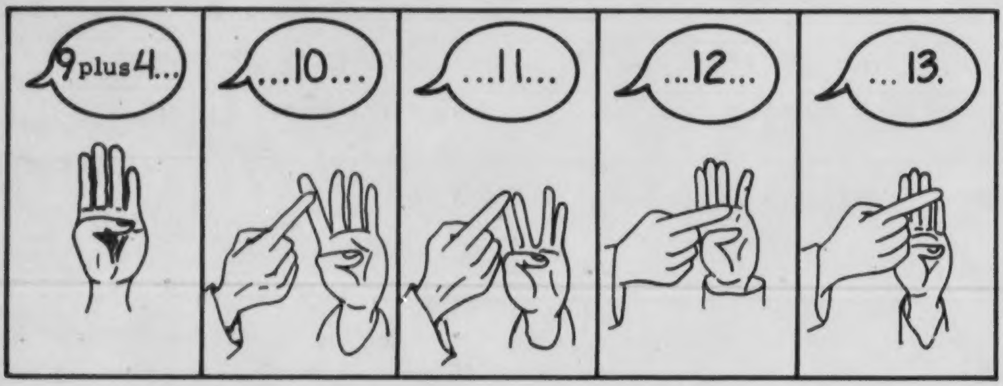
F 76

T: What number is 9 + 4 ?

S: 13.

T: Right. 9 plus 4 (hold up four fingers of one hand).

9 (point to each of the four fingers in turn, as you say) 10, 11, 12, 13. 9 plus 4 equals 13.



When interest in the mental arithmetic activity wanes, distribute the individual Minicomputers.

T: I have two friends who are brothers and each has some pennies. Their mother's birthday is next week and they are going to put all their pennies together to buy a birthday present. Let's see if we can figure out how many pennies they have all together. What do we need to know, to solve this problem?

S: How many pennies each brother has.

T: Yes; that's right. But I'm not going to tell you that; you must discover it yourselves. I will give you a clue. The older brother has more than 60 pennies but less than 70 pennies.

Each time a student offers a guess, ask:

T: Is that more than 60? Is that less than 70?

If the answer to either question is "no", say that this cannot be the number. Accept guesses until 64 is offered. Each time a number between 60 and 70 is the guess, affirm that it is a good guess, but not how many pennies the older brother has.

S: 64.

T: That's right. The older brother has 64 pennies. Put 64 on your Minicomputers.

Write "64" on the board and ask someone to put 64 on the demonstration Minicomputer.

T: Leave the 64 on your Minicomputers and let's see if you can discover how many pennies the younger brother has. He has more than 20 pennies, but less than 30 pennies.

Accept guesses in the same manner suggested above, asking "Is that more than 20?" and "Is that less than 30?" each time. Continue until it is discovered that the younger brother has 25 pennies.

S: 25.

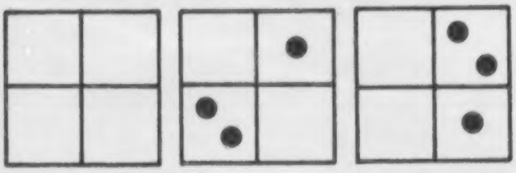
T: That's right; the younger brother has 25 pennies.

Write this calculation on the board.

$$\begin{array}{r} 64 \\ +\,25 \\ \hline \end{array}$$

T: Since we are adding, leave 64 on your Minicomputer and add checkers for 25.

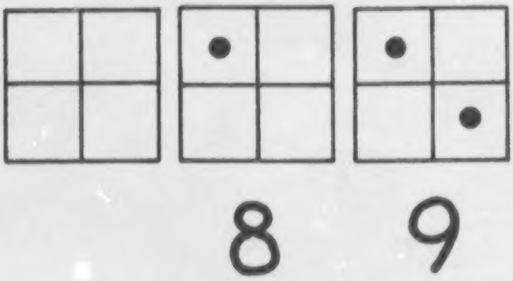
Ask someone to add 25 to the demonstration Minicomputer. If standard configurations are used, the Minicomputer will now look like this.



T: If you see some plays, you may make them. Otherwise, just watch carefully.

Call on volunteers to make plays on the demonstration Minicomputer, allowing enough time between plays for the students to make the play on their individual Minicomputers. The "4 + 4 = 8", "20 + 20 = 40", and "40 + 40 = 80" plays are all useful here; others may be needed if nonstandard representations were suggested earlier.

Continue until a standard configuration is on the Minicomputer. Choose a volunteer to write the appropriate numerals under the boards and complete the number story yourself.



$$\begin{array}{r} 64 \\ +25 \\ \hline 89 \end{array}$$

F77 The Functions + 3 and - 3

CAPSULE LESSON SUMMARY

Label the dots in a + 3 arrow picture and draw return - 3 arrows. Locate missing numbers on other similar + 3 arrow pictures.

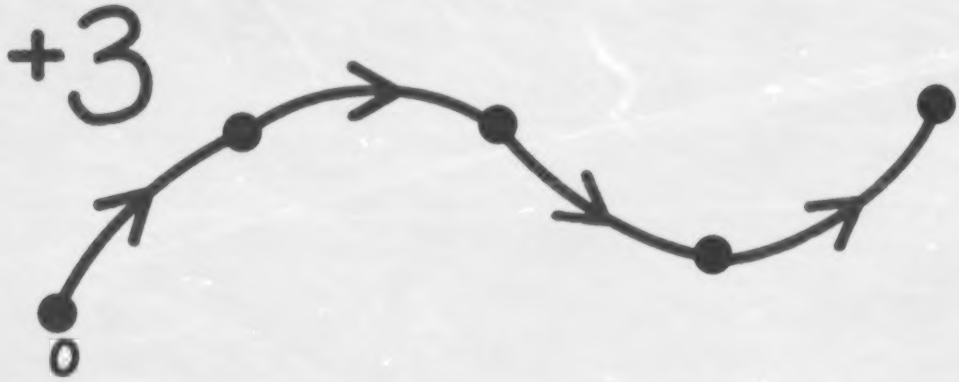
MATERIALS

Teacher : Colored chalk

Student : Colored pens, pencils or crayons ; Worksheet F77

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



T : Who can label a dot?

Call on students to label the dots. Each time a dot is labeled, read the story told by the arrow ending at that dot. If, for example, a student labels the second dot " 3 ", say :

T : 0 (point to the first dot) plus 3 (trace the arrow) is 3 (point to the second dot).

Count three forward on your fingers or on the number line or on the numeral chart to demonstrate the correct labeling of a dot.

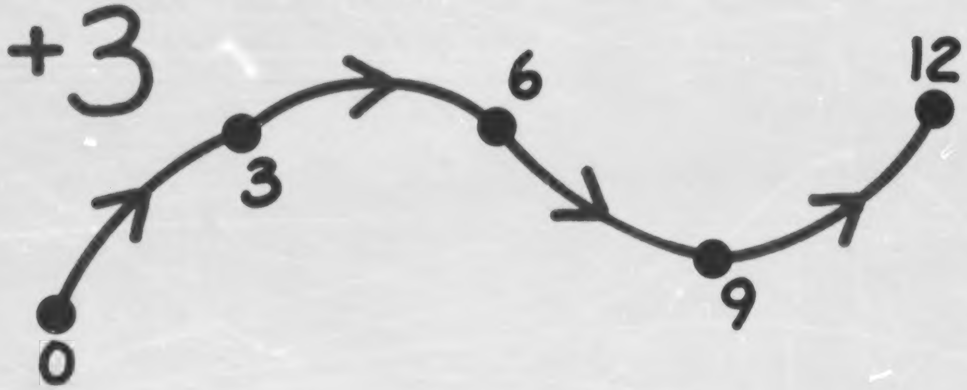
F 77

If a student labels a dot whose preceding dot has not been labeled, say:

T: That may be correct; we will check when we know some more dots.

When the preceding dot has been labeled and checked, be sure to check what was postponed.

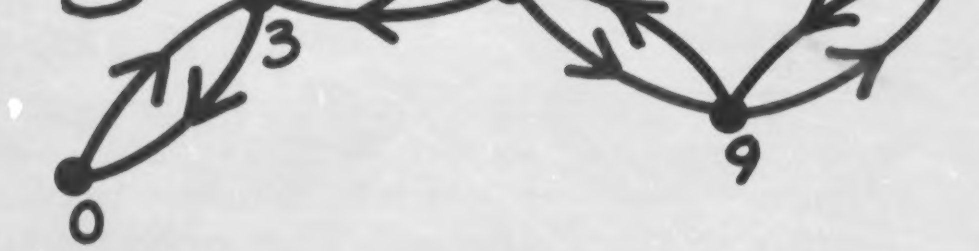
Continue until all the dots have been labeled.



In red, write " - 3 " near the picture.

T: Who can show me where to draw a - 3 arrow?

Each time an arrow is suggested, read the number story told by the arrow and check by counting three backward on your fingers, on the number line, or on the numeral chart. Continue until all of the - 3 arrows have been drawn.



T: We could continue to draw + 3 arrows and make a long snake. Who knows a number which would not be on this snake?

If a student suggests a large number, such as 100, respond:

T: That's right, 100 is not on the snake now. If we continue to draw + 3 arrows, would we ever meet 100?

The students will probably not agree on this last point.

T: We could find out by drawing arrows, but we would need a lot of them. Who knows a different number which would not be on the snake, even if more arrows were drawn?

S: 7.

T: How do you know this number would not be on the snake?

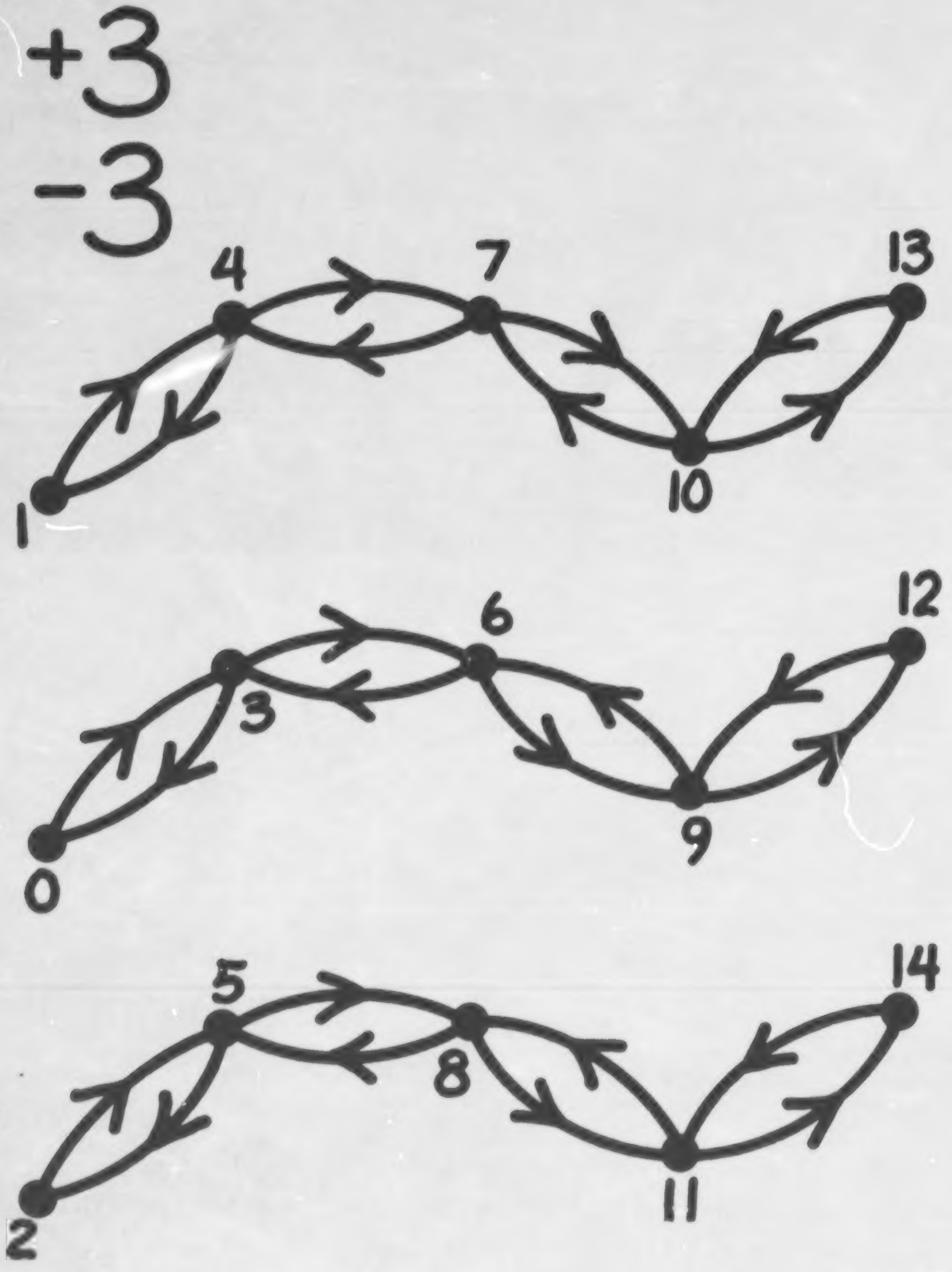
S: Because there is no dot for 7 now and if you go on drawing + 3 arrows, the numbers just get bigger than 12.

S: 14, because the next number we meet is 15 and we miss 14.

For each suggested number which is not on this + 3 snake, begin to draw a new snake (with blue arrows only) on which the number will appear. (Necessarily, each of the numbers from 1 to 14 appears on one of the three + 3 snakes in the next illustration.)

Continue to draw the two new snakes as numbers are suggested, each time asking students to label the dots and add - 3 arrows.

F 77

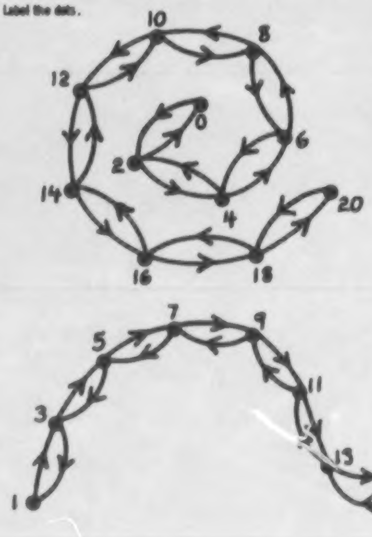

+3
-3
4
7
13
1
10
6
12
3
0
9
5
14
8
2
11

Display Worksheet F77 to the students and explain that they are to label the dots and then to draw - 2 arrows (on the front side of the worksheet), or - 4 and + 4 arrows (on the reverse side).

Name ______________________

F 77

Label the dots.

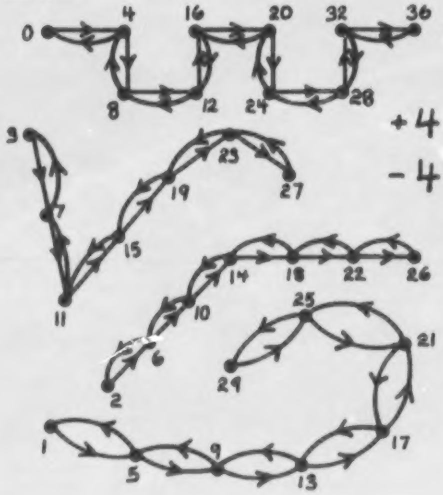

10
8
12
0
6
2
14
4
20
16
18
7
9
5
11
3
13
15
1

+2

-2

F 77

Label the dots.


0
4
16
20
32
36
8
12
24
28
3
23
7
19
27
15
11
14
18
22
26
10
25
6
21
2
29
1
5
9
13
17

+4

-4

F 78

F78 A 2 × Snake

CAPSULE LESSON SUMMARY

Label the dots in a 2 × arrow picture using the Minicomputer to help with the calculations.

MATERIALS

Teacher: Minicomputer set; colored chalk

Student: None

DESCRIPTION OF LESSON

Begin the lesson with about ten minutes of putting numbers on the demonstration Minicomputer and recognizing them, as follows.

T: Who would like to put my secret number on the Minicomputer?

Choose a volunteer and whisper your secret number to the student. Pick numbers between 100 and 999 whose difficulty is appropriate for that particular student. Numbers which can be shown with checkers on the hundreds' board alone (such as 400, 600, and so on) may be easier than numbers like 240, 401, 480, 128, etc. The most difficult numbers are those whose standard configurations use more than one checker on all three boards, such as 735, 679, etc.

When the student has put the number on the Minicomputer, continue.

T: Who knows the secret number?

Ask a student to write the appropriate numerals under the Minicomputer boards, and ask a second student to read the number. When this has been done, ask the first student if this, indeed, is the secret number.

Repeat this activity several times allowing many students to participate in putting and reading numbers on the Minicomputer.

Proceed to the following doubling activity.

T: Hold up one finger.
Now show me twice as many fingers.

Pause to allow the class to respond, and then demonstrate this yourself.

T: One finger (hold up one finger). Now, twice as many (hold up the same finger on the other hand). 2 times 1 is 2.

Hold up two fingers.
Now, show me twice as many fingers.

Pause a moment to let the class respond, and then demonstrate yourself.

T: 2 (hold up two fingers) times 2 (hold up the same two fingers of your other hand) is . . . ?

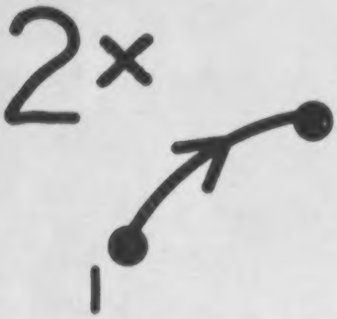
S: 4.

Repeat this activity for the double of 5, 3, and 4.

T: Let's make up a story about Debby (substitute the name of one of your students whose birthday is near). Debby has a birthday soon and Debby's uncle has promised to give her a special present. On her birthday, he will give her one penny; on the next day, he will give her twice as many pennies; and on the day after that, twice as many again. Her uncle will continue to double the number of pennies, so long as Debby can figure out how many pennies he has to give her. Let's see if we can help Debby discover these amounts.

F 78

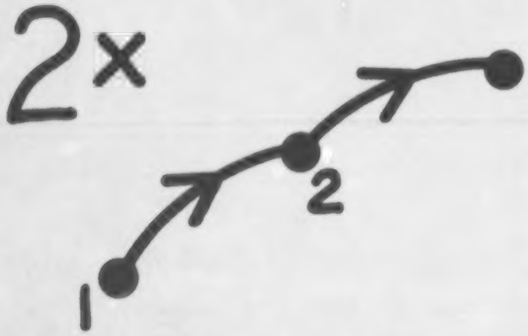
Begin this arrow picture on the board.



T: On her birthday, Debby receives one penny (point to the first dot). On the next day, she gets twice as many (trace the arrow). What is 2 times 1?

S: 2.

Demonstrate this number story with your fingers again, label the dot, and then draw a second blue arrow.

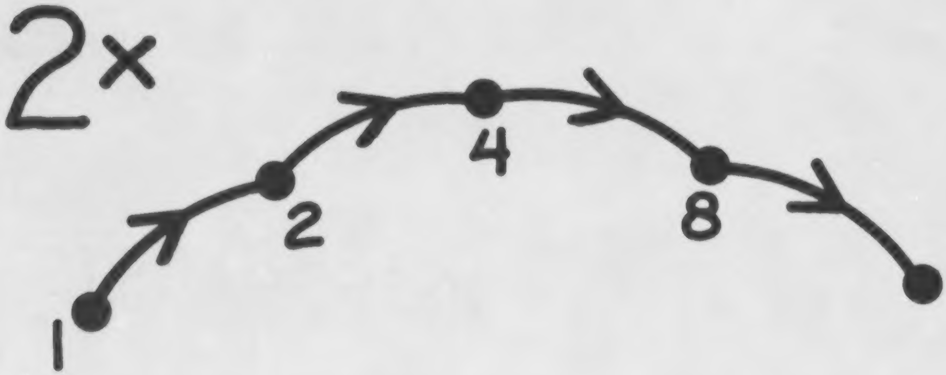


T: The second day she gets two pennies. How many on the next day (trace the second blue arrow and point to its ending dot)?

S: Four.

T: Very good; 2 times 2 (demonstrate with your fingers) is 4.

Label the third dot "4", add another arrow, and repeat this process for the next day (2 × 4 = 8). Again, draw an arrow so that your picture looks like this.



T: On this day (point to the dot labeled "8"), she gets eight pennies. How many the next day?

Begin this number story on the board.

$$2 \times 8 =$$

Your class may or may not be able to calculate "2 × 8". Ask how we can find the answer. Someone may suggest counting with the fingers of two students. If so, try this method and then ask for another way. Encourage the class to think about how they could use the Minicomputer.

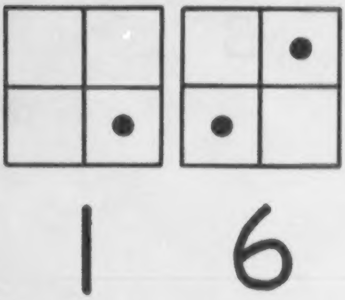
T: How can we calculate "2 × 8" on the Minicomputer?

F 78

You may need to ask how many eights in 2 × 8 and then ask a student to write two eights another way.

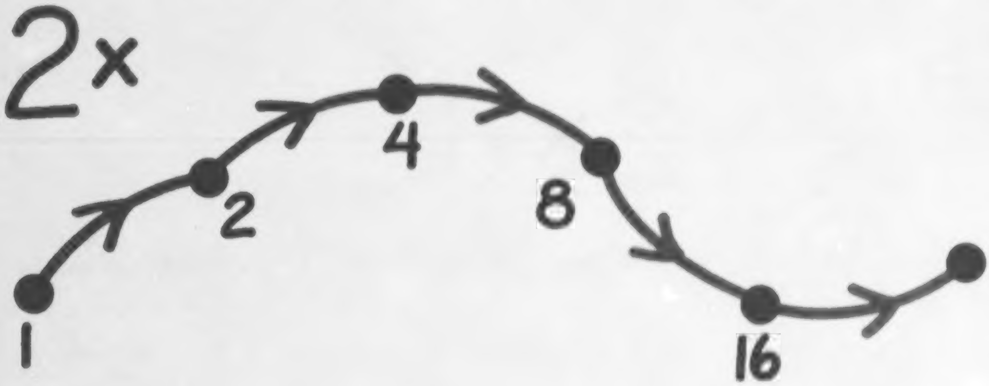
$$2 \times 8 = 8 + 8 =$$

Choose volunteers to put 8 on the Minicomputer two times. Then let the class make plays (backward plays are needed) until the standard configuration is on the Minicomputer. Complete the number story.



$$2 \times 8 = 8 + 8 = 16$$

On your arrow picture, label the dot for 16 and add another arrow.



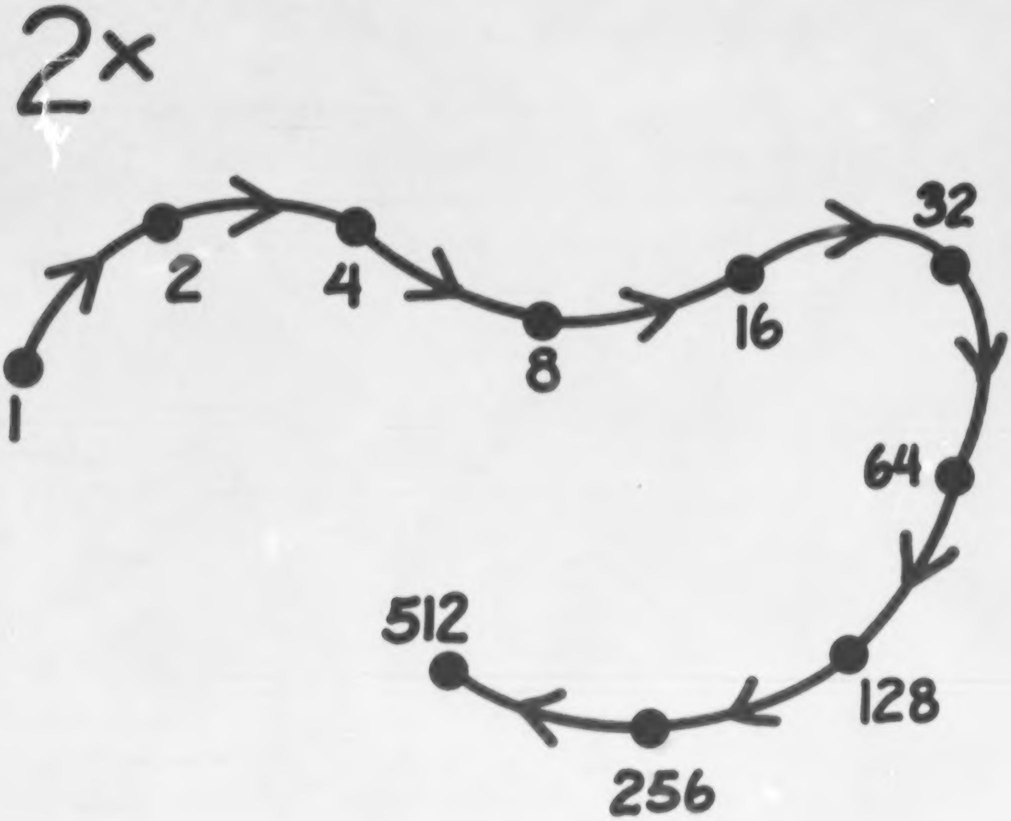
Point to the dot labeled " 16 " and then to the Minicomputer.

T: We have 16 pennies. How can we calculate "2 × 16 "?

S: Put 16 more on the Minicomputer.

Ask a student to put 16 more on the Minicomputer, and call on students to make plays.

Label the dot for 32, draw another arrow, and repeat this activity for "2 x 32". Continue as long as time and interest allow. For your reference, an extended arrow picture is shown below.



F 79

F79.1 Multiplication Problem # 2

CAPSULE LESSON SUMMARY

Do a 2 × calculation on the Minicomputer to determine how many hands the students in your class have all together.

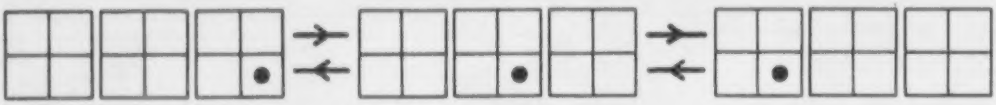
MATERIALS

Teacher : Minicomputer set

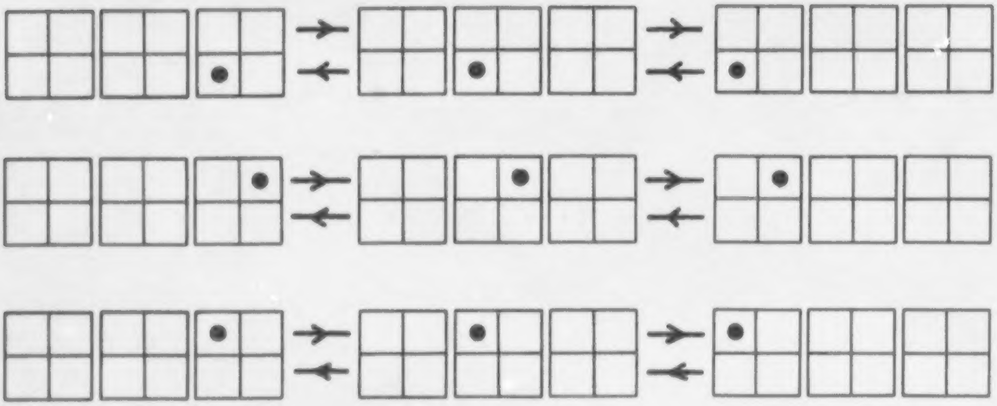
Student : None

DESCRIPTION OF LESSON

Display three Minicomputer boards. Move a checker from the 1 - square to the 10 - square, then to the 100 - square, and vice-versa. Ask the class to say "one", "ten", "one hundred", and so on as you do this.



Continue this activity starting with 2, 4, and 8.

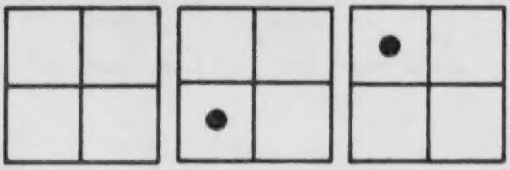


Move the checker around to various squares and each time ask the class which number is on the Minicomputer.

T: How many students are in our class today?

Allow the students to make a count. For the following dialogue, we assume a class of 28 students.

T: There are 28 students in our class today. Who can put 28 on the Minicomputer?



T: If you are 28 students, how many hands do you have all together?

Be sure the students understand that you are asking for the total number of hands in the group. You may wish to ask all of the students to raise their hands.

T: How many hands does each student have? (Two)
Everyone raise your right hand.
How many right hands are in the air, all together? How do you know?

S: 28, because we each have a right hand, and there are 28 of us.

T: Everyone raise your left hand. How many left hands are there?

S: 28.

T: How many hands do you have all together?

F 79

Record the students' guesses on the board.

T: Could we use the Minicomputer to find the answer?

Perhaps someone will suggest calculating "28 + 28" or "2 × 28". If students suggest either of these calculations, write it on the board.

If necessary, ask the students again how many right hands there are and write "28" on the board. Ask how many left hands there are and write "+28" on the board.

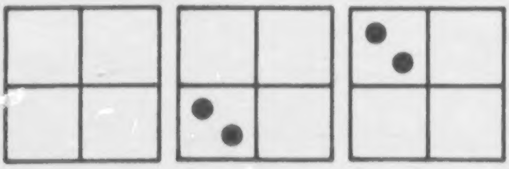
28 + 28

T: There are 28 right hands and 28 left hands.
Does anyone know another number story we could write?

If necessary, suggest the multiplication story yourself and write it on the board.

28 + 28
2 × 28

Remind the class that 28 is already on the Minicomputer. Someone should suggest putting another 28 on the Minicomputer. Send a student to the Minicomputer to do this.

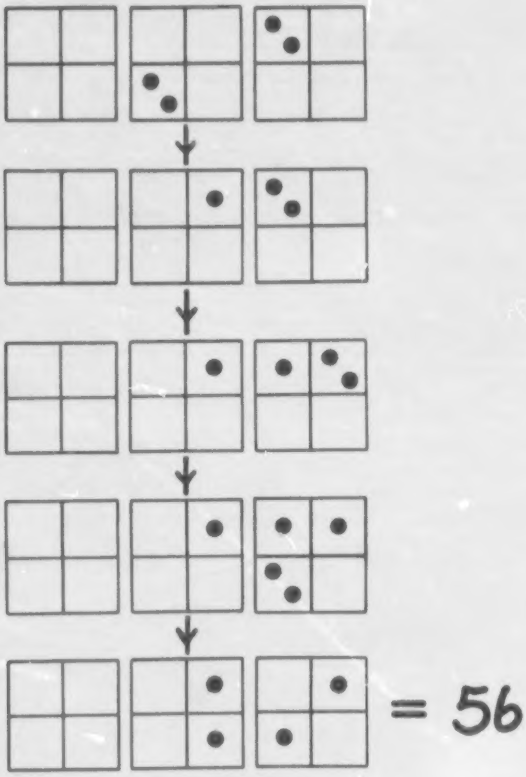


T: Is it easy to read this number? What should we do to make it easier to read?

S: Make some plays.

T: Who would like to make a play?

Invite students to make plays. You may need to suggest making some backward plays. Be sure the students realize that the reason for making backward plays is to get a checker on the 2-square so that they can make an "8 + 2 = 10" play. A possible sequence of plays is shown below.



20 + 20 = 40

8 = 4 + 4

4 = 2 + 2

8 + 2 = 10

T: Do you know, now, how many hands you have all together?

S: 56.

Ask a student to complete the number stories on the board. Determine which guess was the best. If some students predicted the total correctly, you may wish to ask them to explain their methods to the class.

F 79

F79.2 Same First Initial #2

CAPSULE LESSON SUMMARY

Draw an arrow picture of the relation "I have the same first initial as you" where the dots are for students in the class.

MATERIALS

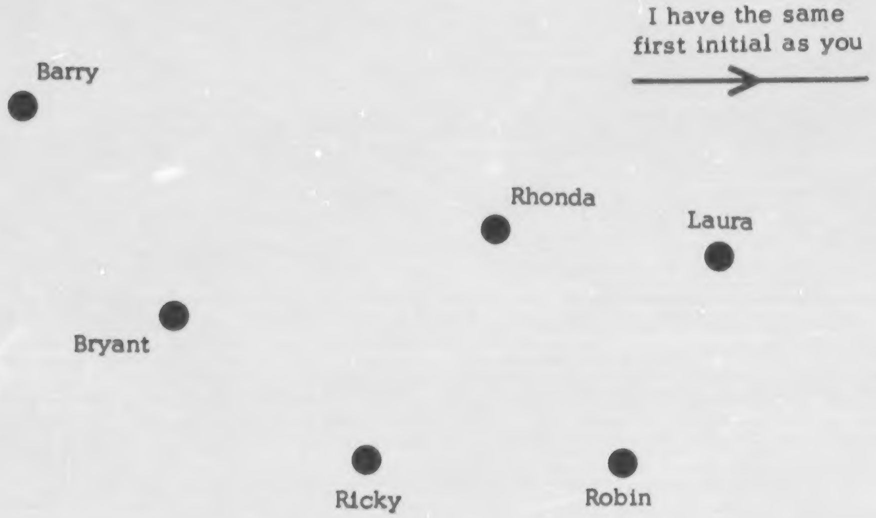
Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

NOTE: Refer to the alphabetical class list described in Lesson F73.1, Same First Initial #1 (see page 510) to choose six students to be the stars of this lesson. As mentioned in Lesson F73.1, this lesson is described with a group of three students, all having the same first initial; another group of two students having the same first initial; and a third group of just one student whose first initial is different from all the rest.

On the board draw and label a dot for each of the students you have chosen, and draw a key arrow for "I have the same first initial as you." For example,



T: Robin, point to your dot in this arrow picture.

After the student has done so, point to a second dot.

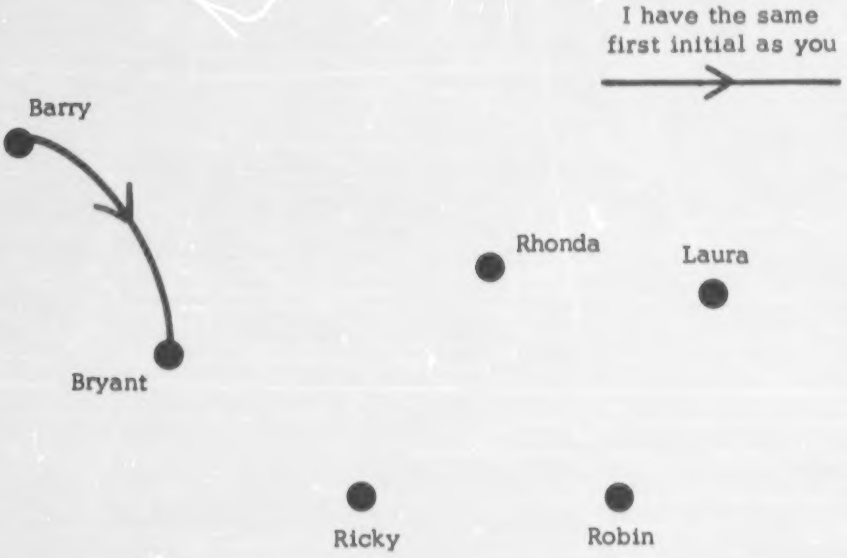
T: Would this student please stand up? Thank you.
Who else is in my picture?

Ask students, one at a time, to the board until all of the dots have been identified. (This activity is necessary because some students may find it difficult to read their classmates' names.) Refer to your drawing on the board.

T: These students are pointing to each other and are saying "I have the same first initial as you." Which of these students can point to another and say this?

S: Barry can point to Bryant.

T: Does Barry have the same first initial as Bryant? (Yes)
I will draw an arrow to show that Barry is pointing to Bryant.



T: Can some other students say, "I have the same first initial as you"?

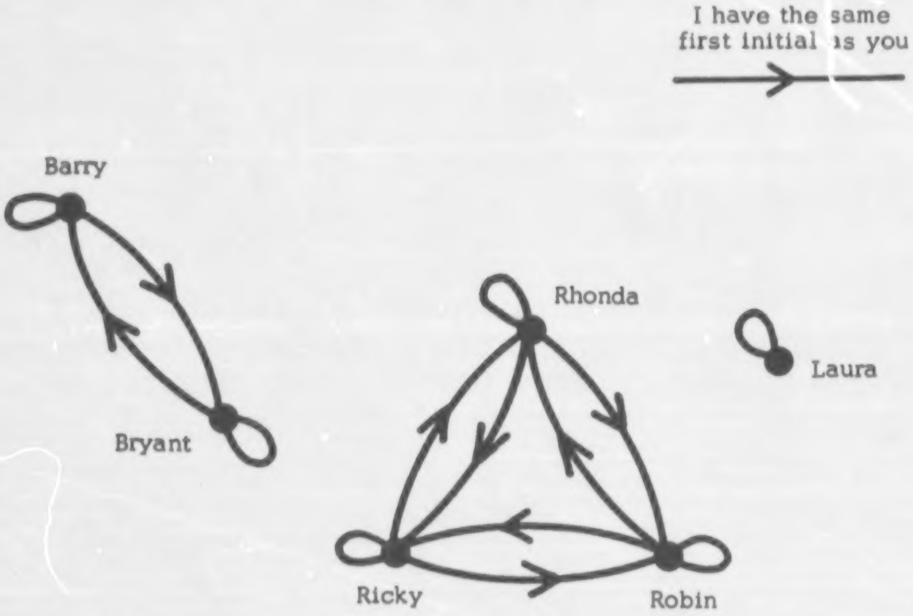
F 79

Invite students to trace arrows; if an arrow is correctly traced, draw it in yourself. Continue in this way until all possible arrows have been drawn.

If no one realizes that the students may each point to themselves, hint at this fact.

T: Laura, isn't there someone in this group to whom you can point? Point to someone whose name begins with "L".

Add loops to your picture as they are suggested.


I have the same first initial as you
Barry
Bryant
Rhonda
Laura
Ricky
Robin

You may wish to ask the students in this arrow picture to act it out at the front of the room. Students who must point to two other children and to themselves may protest that they do not have enough hands for this; suggest that they also use one of their legs to point.

F80 Adjustment Day #8

NOTE: See the General Introduction, p. 16 for a full explanation of the purpose of scheduled adjustment days.

Today you may wish to repeat a previous lesson, either for a group of students, or for the entire class. Many of the lessons can be made to appear completely different by changing the story and/or the numbers. Lessons which you may wish to repeat include the following.

F63.2	A + 1 and + 2 Spiral
F64	Individual Minicomputer Activity #3
F68.2	The Function + 5 (Exercise 1)
F74.1	Transforming a Number #1

If you omitted the worksheets in any previous lesson, you may wish to distribute them today, after an appropriate warm-up activity.

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with S1.1 Addition Problem #1.[*]

Activities for students who need extra help include those listed on previous adjustment days.

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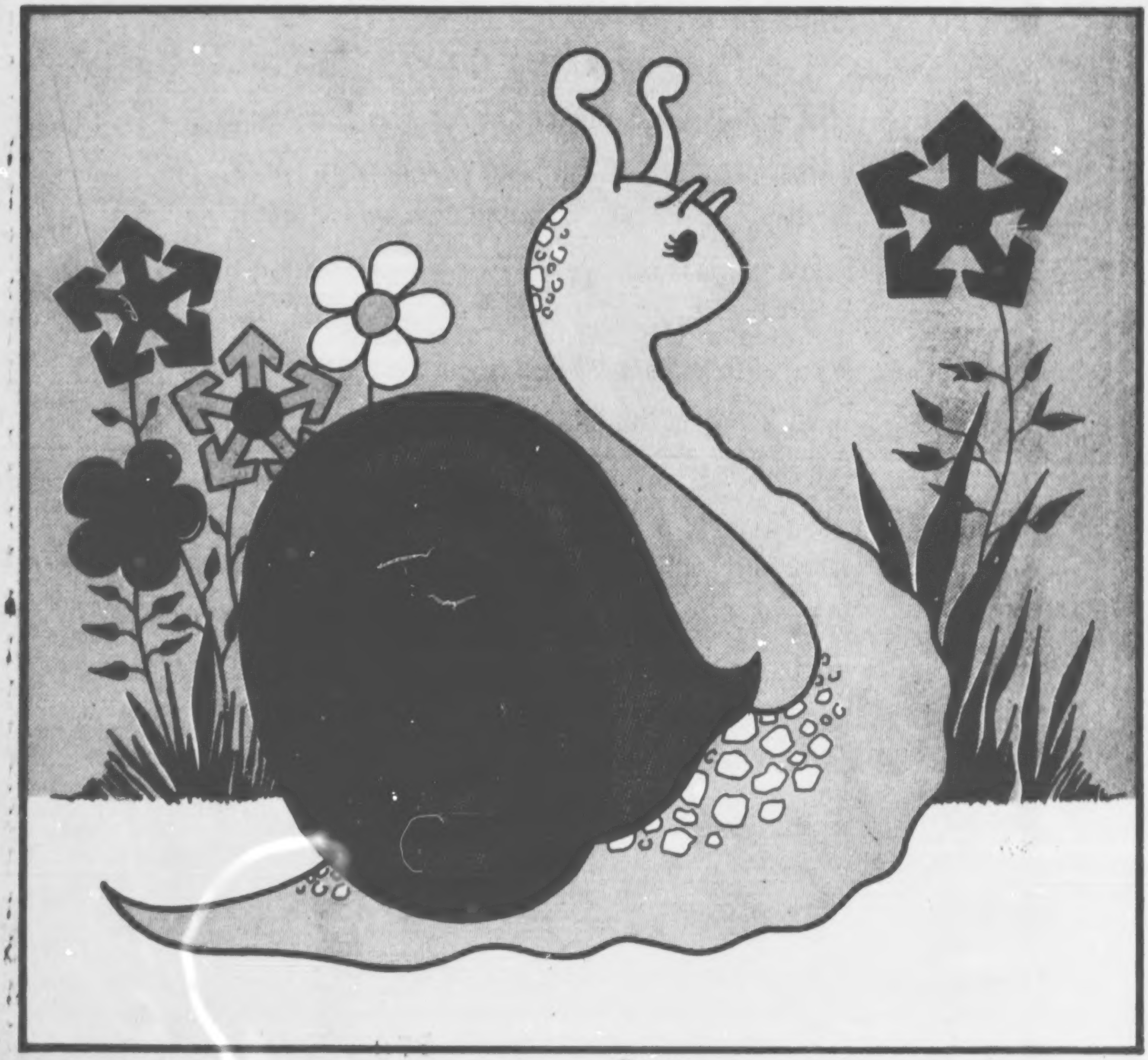
[*] This lesson is to be found in CSMP Mathematics for First Grade, Part II, Teacher's Guide.

CSMP Mathematics for the First Grade
Part I

Comprehensive School Mathematics Program
CEMREL, Inc.
Final Experimental Version
1-28301

Name

Worksheets



WHAT'S IN THIS BOOK?

This book contains all the worksheets a student will need for Part I of the CSMP First Grade Program. Worksheets are labeled with the same letter and number as the lessons with which they are used. If the day-by-day schedule of lessons for first grade is followed, worksheets appear here in the order in which they are used during the semester.

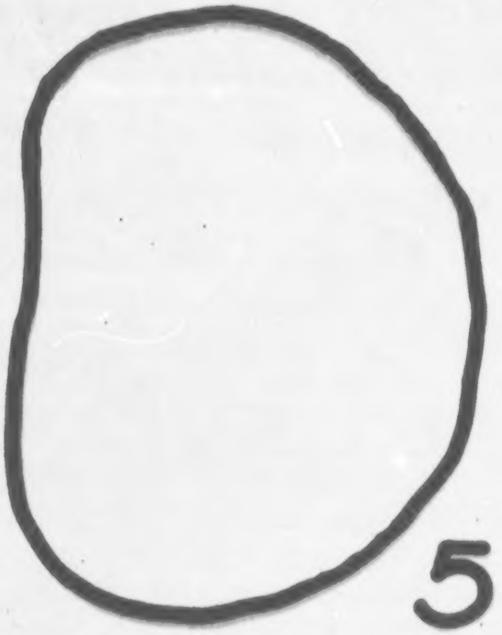
HOW DO YOU REMOVE PAGES?

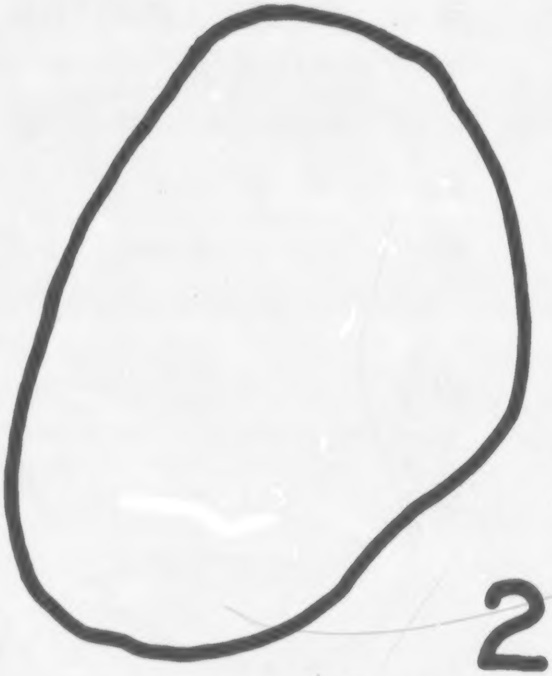
Step 1:	Find the worksheet you want. The number of each worksheet is in the top right corner of the page.
Step 2:	Fold and crease the page along the perforation line.
Step 3:	With your left hand index finger and thumb, press down firmly to the left of the perforation line and along the center fold, starting at the top of the booklet.
Step 4:	With your right hand, hold the top right corner of the page and tear along the perforation line. Follow the tear with your left hand holding down the center fold.

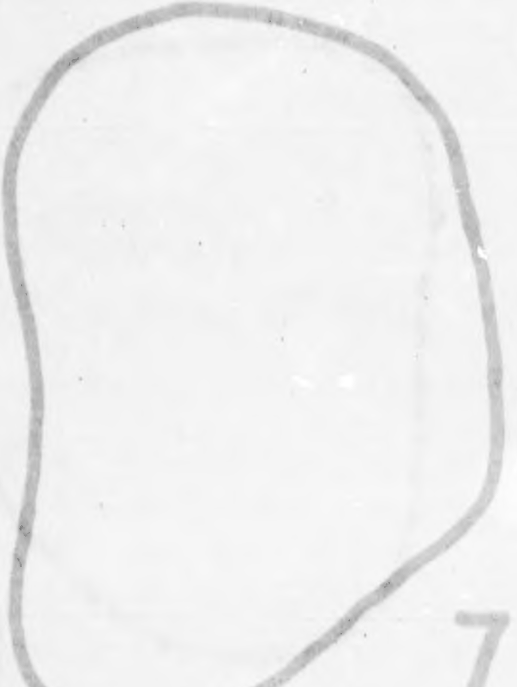
Name ______________________

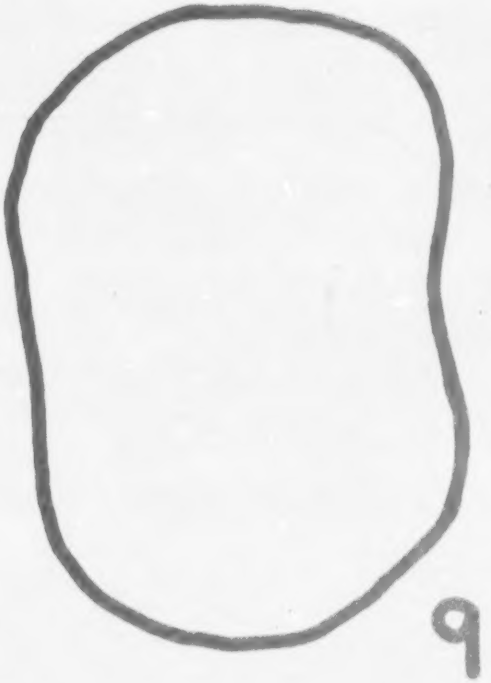
F 2.2 *

Draw the correct number of dots.









Name ____________________

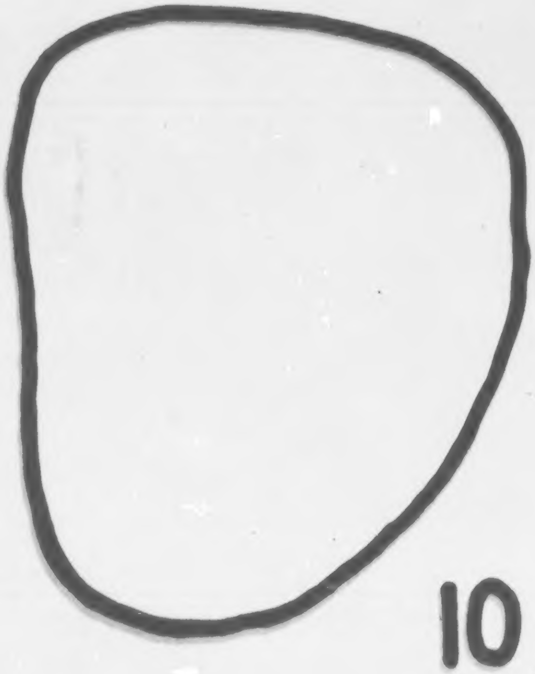
F 2.2 **

Draw the correct number of dots.

16

13

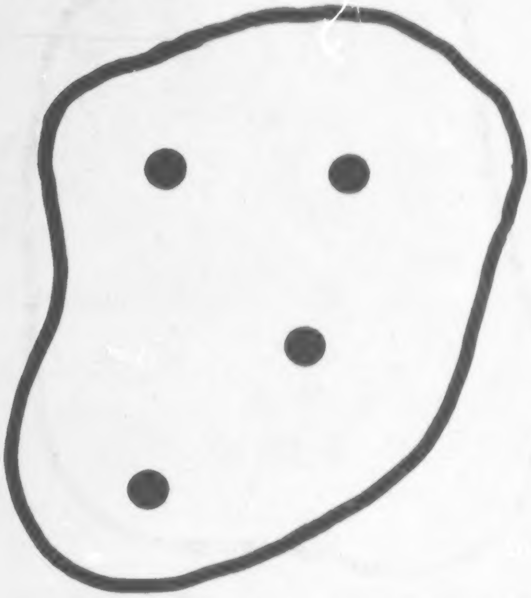
18


10

Name ____________________

F 2.2 ***

Count the dots.



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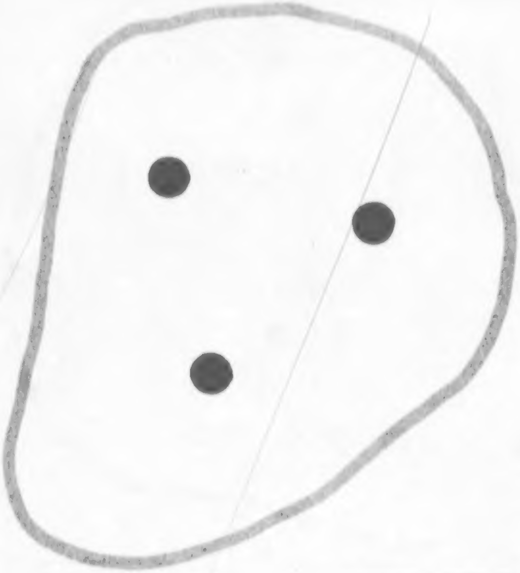

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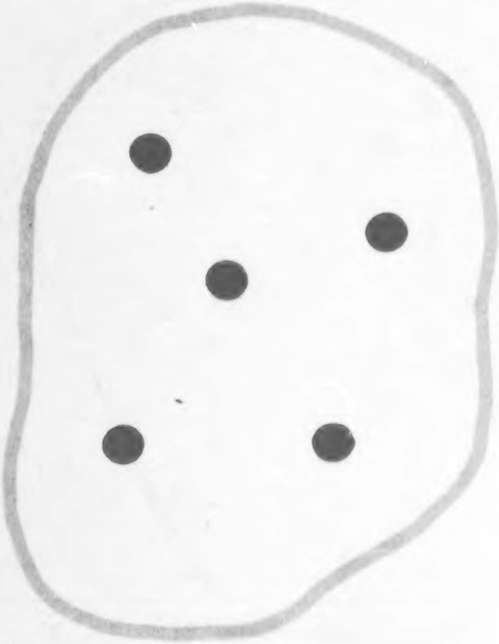

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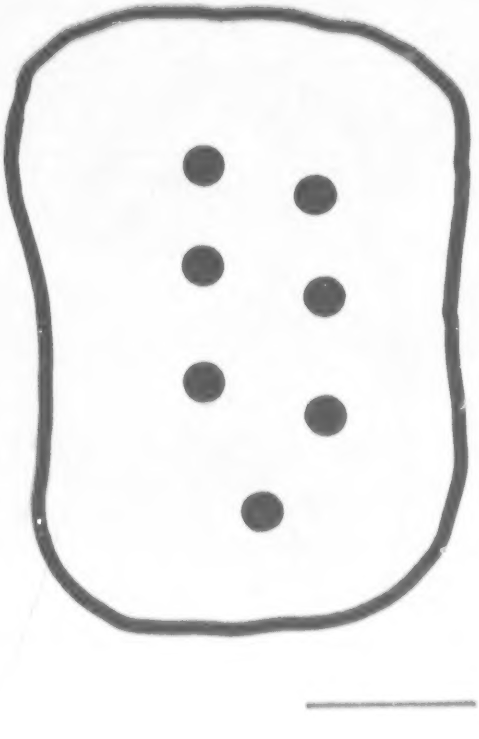
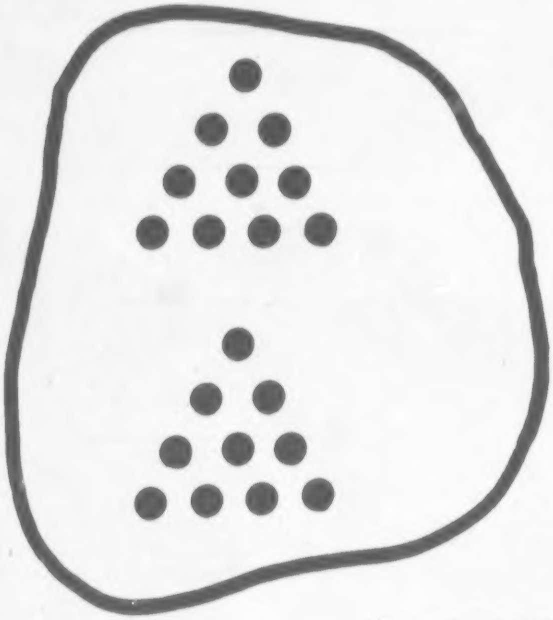


______

Name ______________________

F 2.2 ****

Count the dots.



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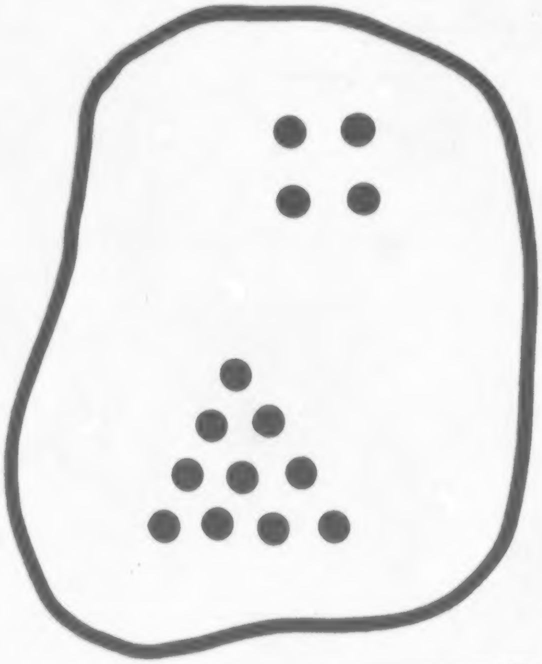

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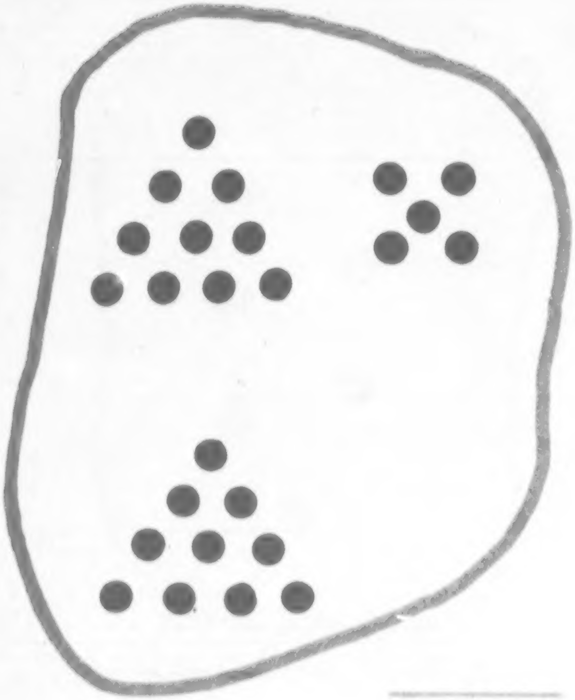

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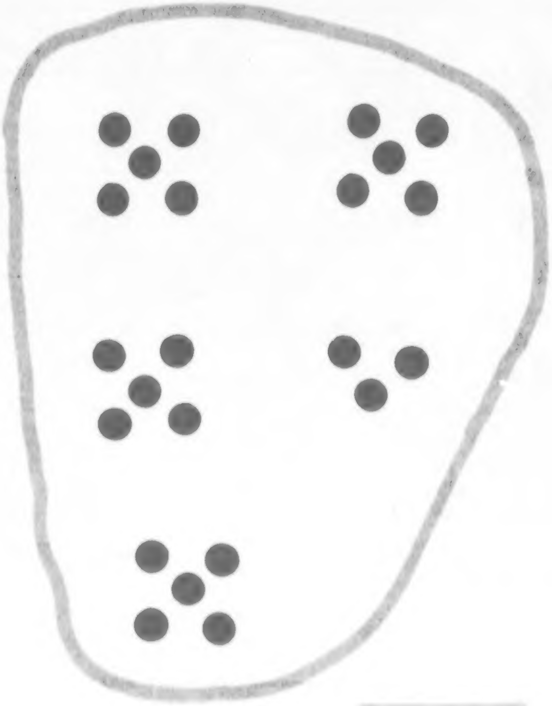


______

Name ____________________ F3 *

Draw the correct number of dots.

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Name ____________________ F 3 **

Draw the correct number of dots.

3	
5	
0	
9	
4	
7	
10	
8	

Name ______________________________

F 6.2 *

Complete these numeral rows.

1	2	3	4	5

2	3	4		6	7

1	2			

2			5		7

	2		4	

2		4			

Name ______________________ **F 6.2 ****

Complete these numeral rows.

1	2	3	4	5	6	7	8	9
3	4		6			9		
2		4			7			
2				6				
1		3		5				
4			7					
1							8	

Name ______________________

F 15.2 *

Count the black dots.

● ● ○ ● ● ● ○	5
● ● ○ ○ ○ ○ ○	2
○ ● ● ● ● ● ○	______
○ ● ○ ● ○ ● ○	______
● ○ ● ○ ● ○ ●	______
○ ○ ○ ● ○ ● ○	______
○ ○ ○ ● ● ● ●	______
● ● ● ○ ○ ● ●	______

Name ______________________________ F 15.2 **

Count the black dots.

● ● ● ● ●   ○ ○ ○ ○ ○   ____

● ● ● ● ●   ● ● ● ○ ○   ____

● ● ● ● ○   ● ● ● ○ ○   ____

○ ○ ○ ○ ○   ● ● ● ● ●   ____

● ○ ○ ○ ○   ● ● ● ● ●   ____

● ● ○ ○ ○   ● ● ● ● ●   ____

● ● ● ● ○   ○ ● ● ● ●   ____

● ● ● ● ●   ● ● ● ● ●   ____

Name ______________________________

F 15.2 ***

Count the black dots.

●●●●● ●●●●● ●●●●● ______

●●●●● ●●●●● ●●●●○ ______

○●○●○ ●●●●○ ○○○○○ ______

●●○●● ●●○●● ●●○●● ______

●●●●● ●●●●● ○○○○○ ______

●●●●● ●○●○● ●●●●● ______

●○●○● ●○●○● ●○●○● ______

○●○●○ ○●○●○ ○●○●○ ______

○●○●○ ●○●○● ○●○●○ ______

Name ______________________

F15.2 ****

Count the black dots.

●●●●● ●●○●●
●●●●● ●○●○● ____

●●●●● ●●●●●
●●●●● ●●●●○ ____

●●●●● ●●○●●
●●○●● ●●●●● ____

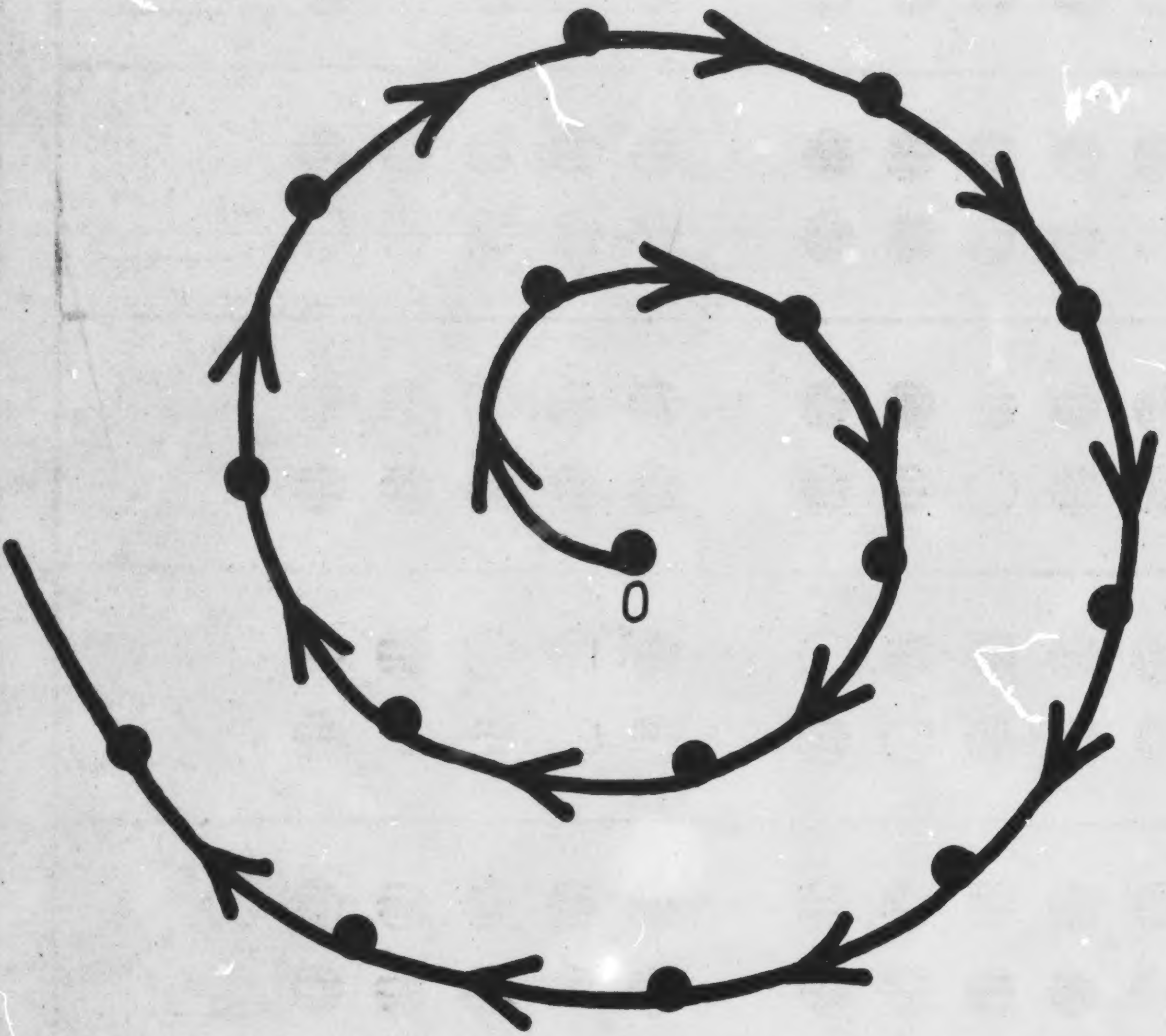
●●●●○ ●●○●●
●●●○● ●○●●● ____

●●●●● ●●●●●
●●●●● ●●●●● ____

Name ________________

F 16.2

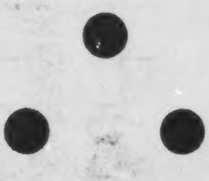
Label the dots.

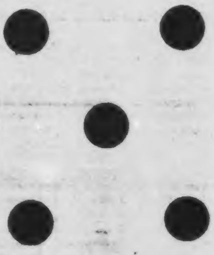


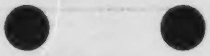
Name ______________________

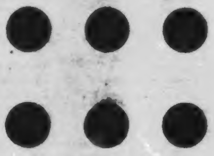
F 17.2 *

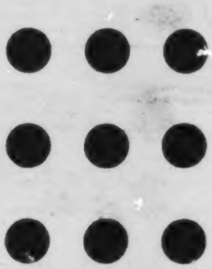
Draw Goldy's mouth.







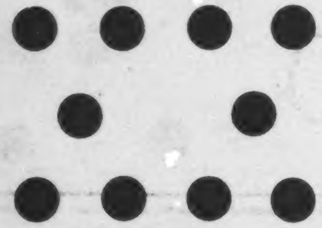


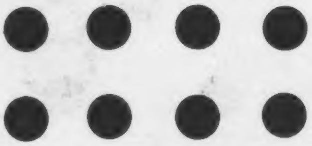


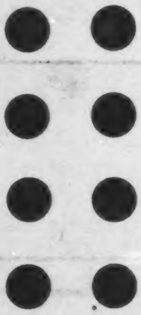
Name

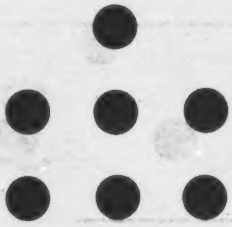
F17.2 **

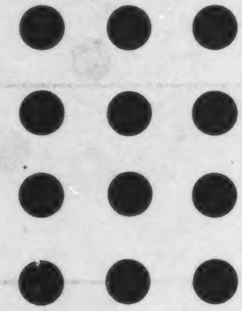
Draw Goldy's mouth.

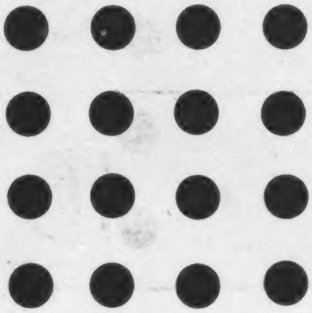


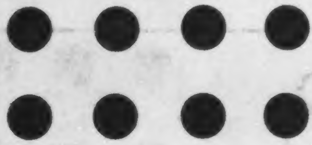


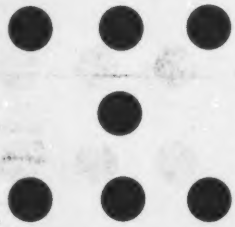












Name ______________________ **F 25.2 ***

Write <, >, or =.

8 < 10

7 9

3 6

5 5

10 2

4 1

5 8

Name ______________________

F 25.2

Write <, >, or =.

1 + 1   3

2   2 + 1

2 + 3   5

2 + 3   1

6   2 + 4

9   8

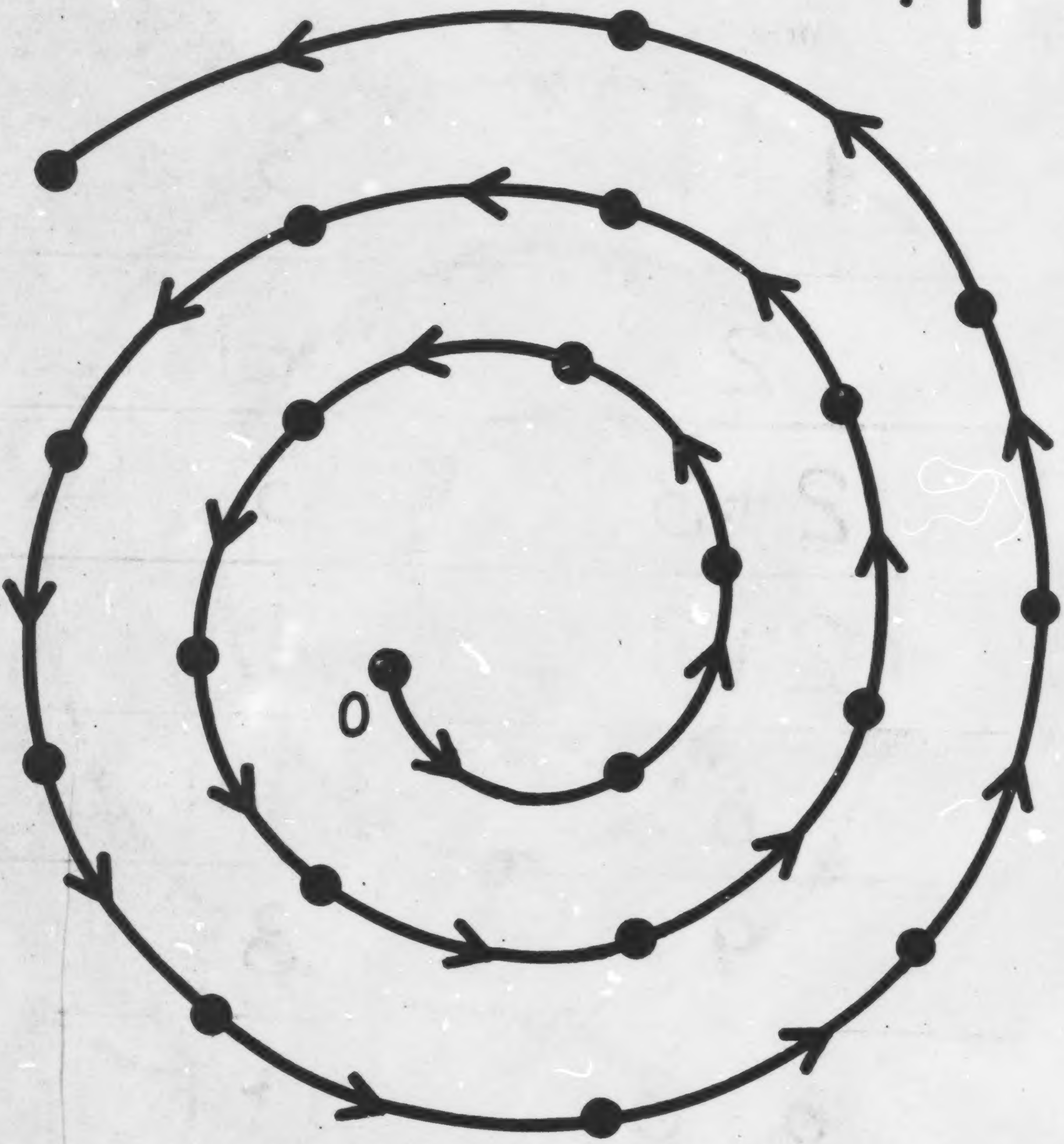
6 + 3   6 + 1

Name ______________________

F 27.2 *

Label the dots.

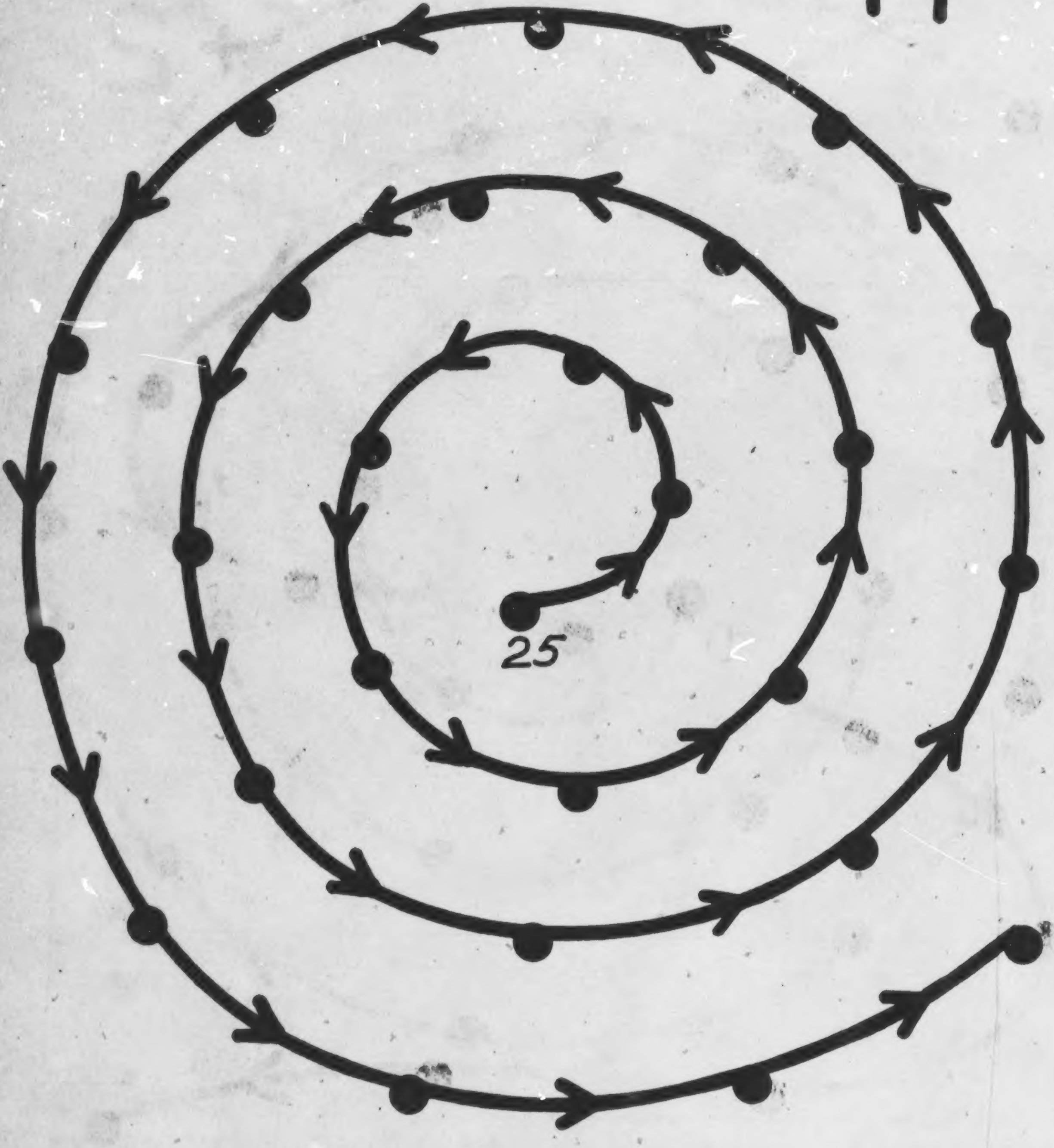
+ 1



Name ____________________ **F 27.2 ****

Label the dots.

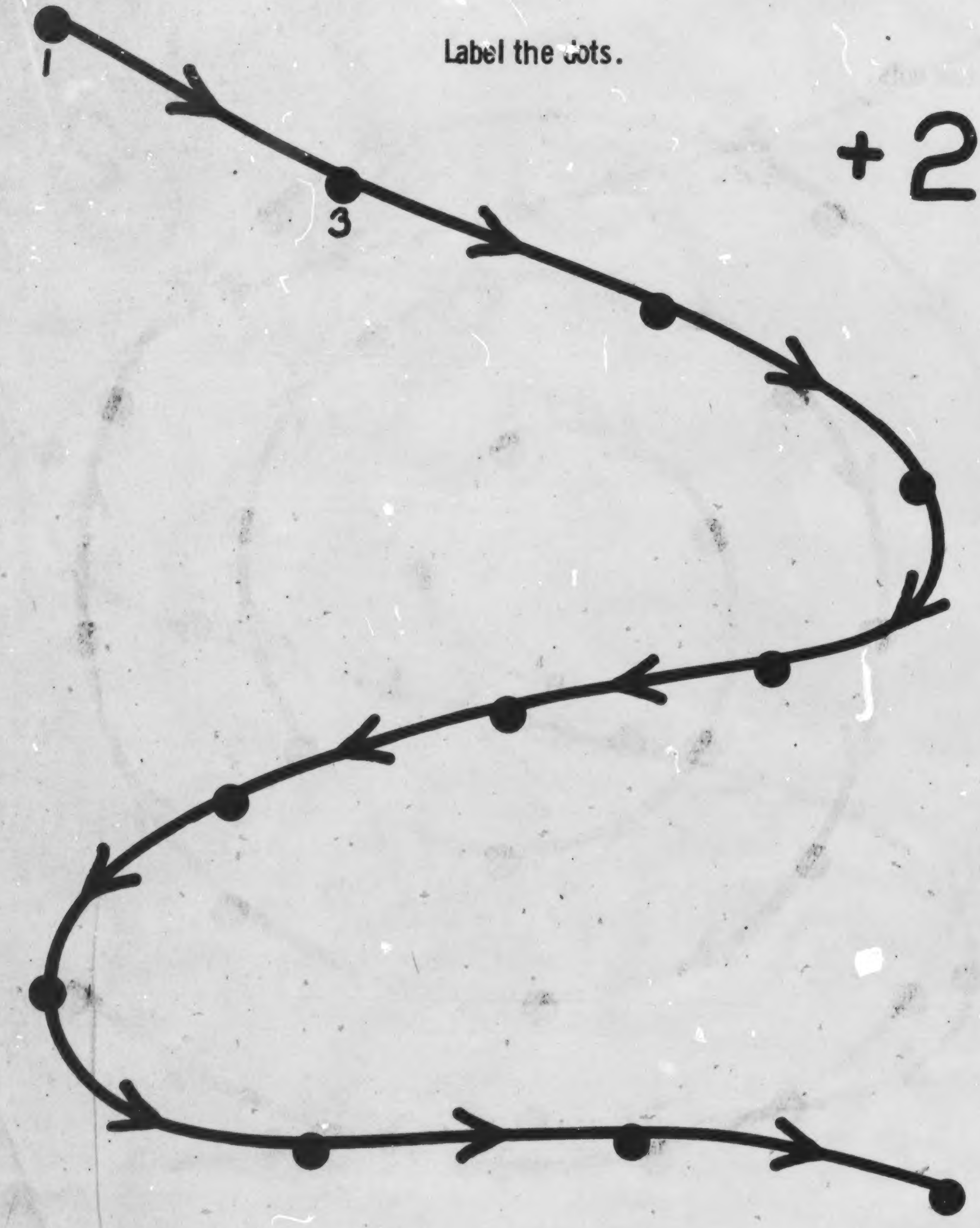
+1



Name ________________________

F 34.2 *

Label the dots.

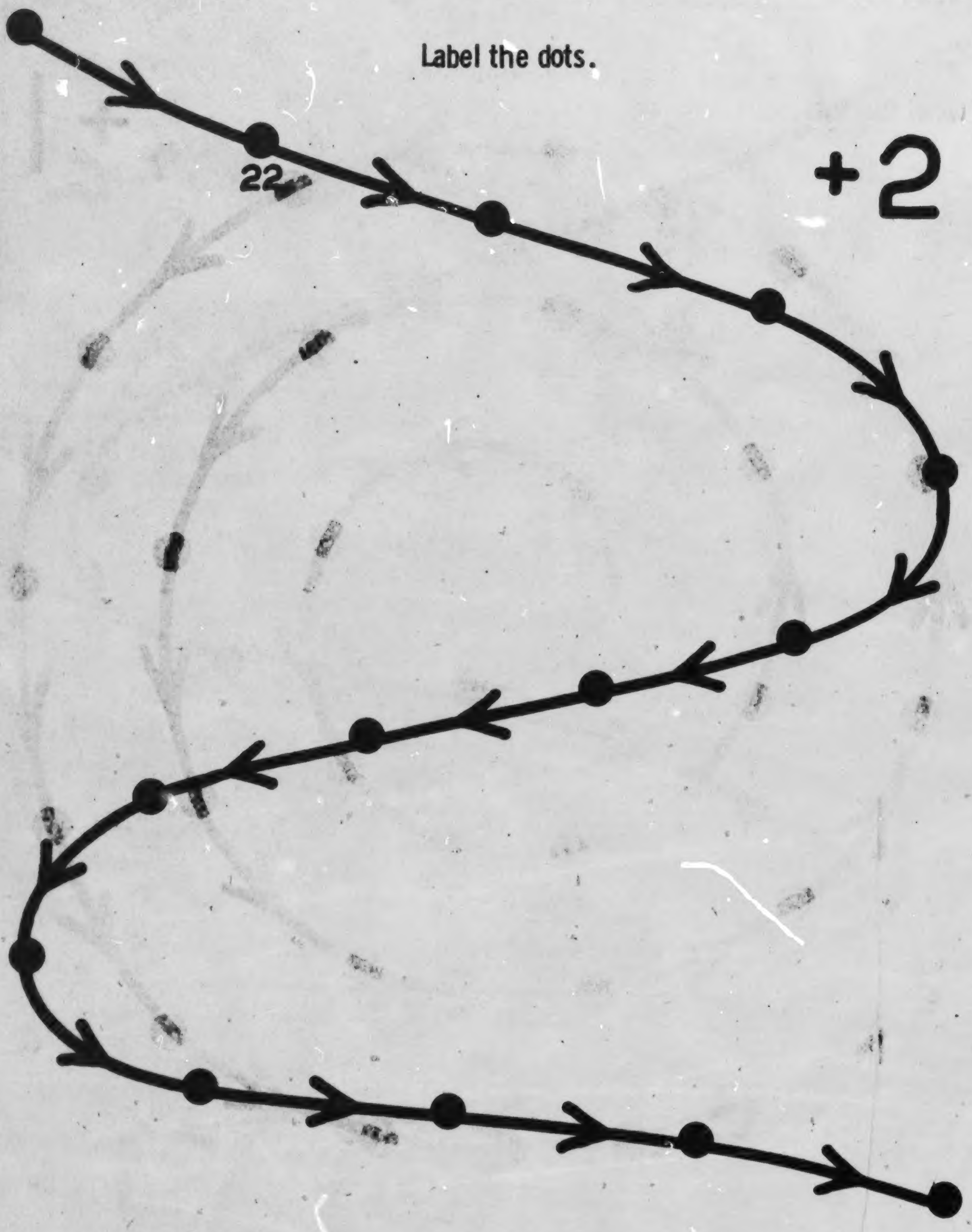


Name

F 34.2 **

Label the dots.

+2

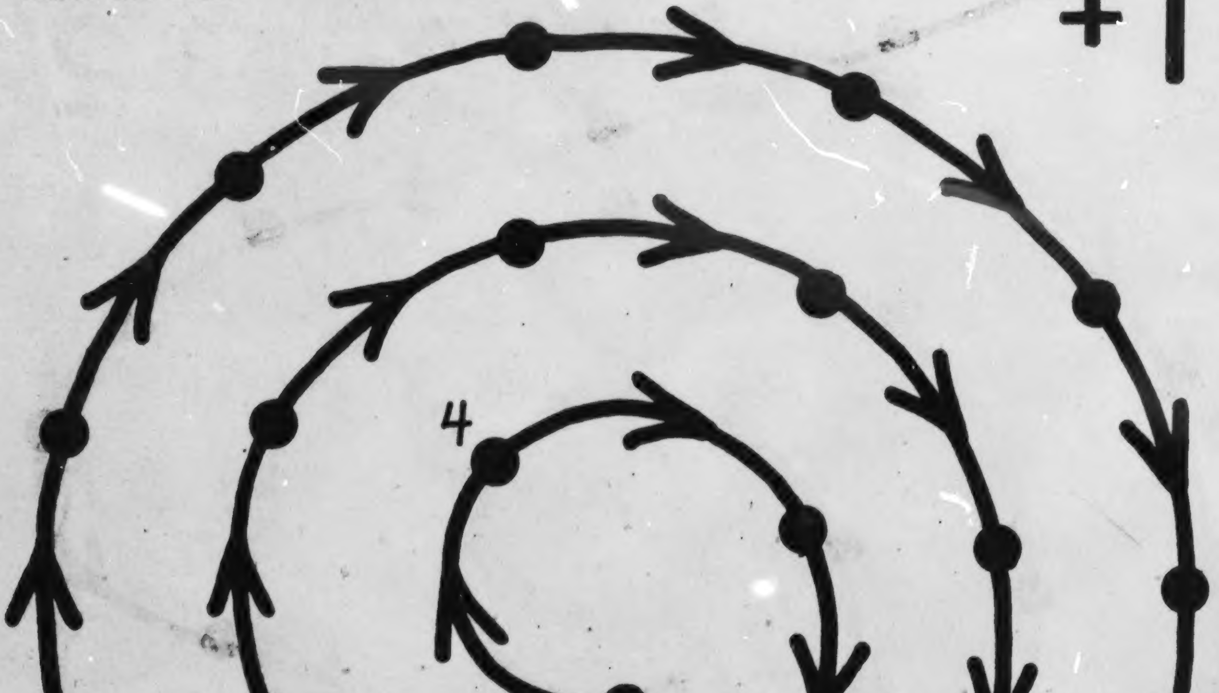


Name

F 38.2 *

Label the dots.

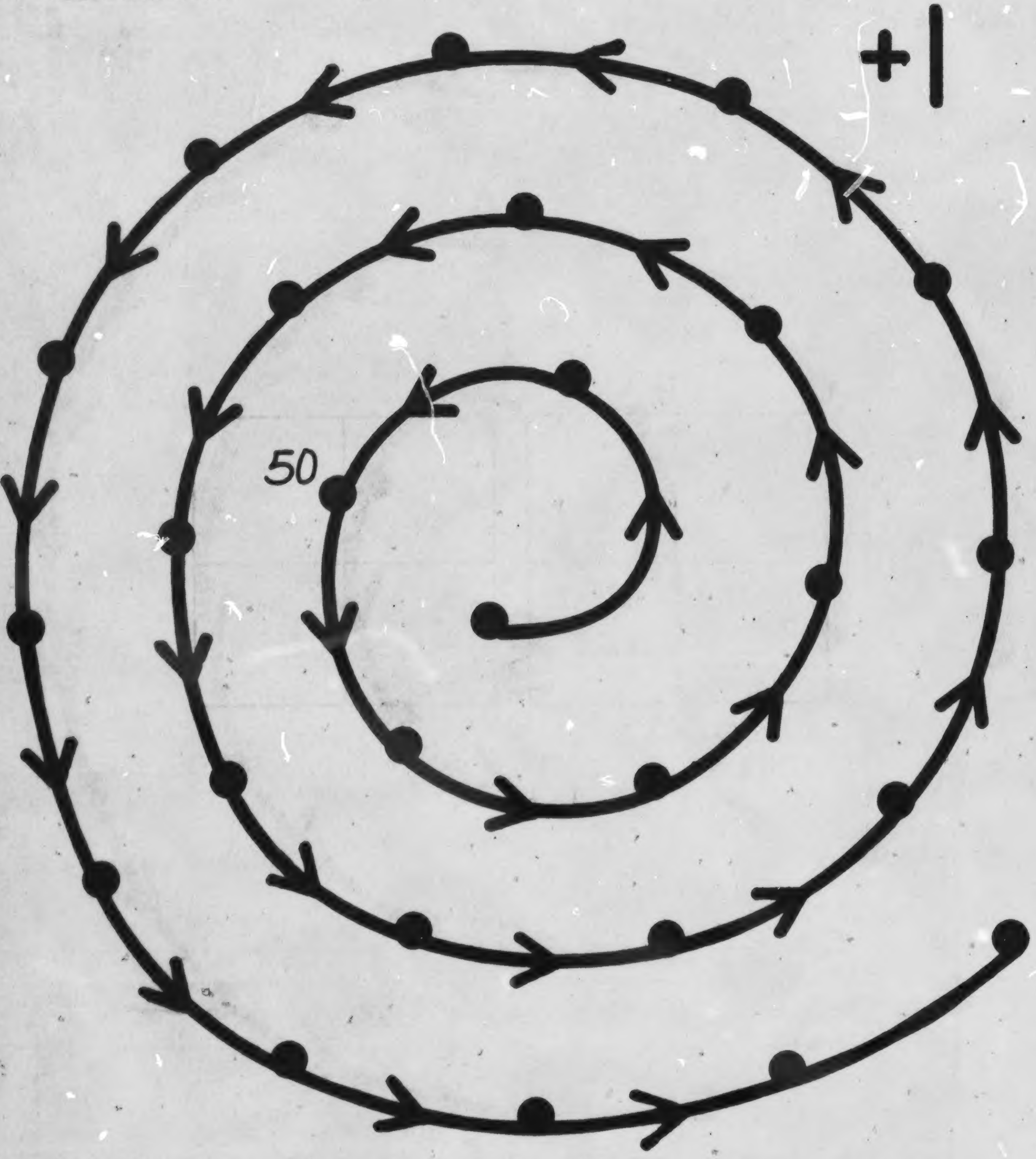
+ |



Name ______________________

F 38.2 **

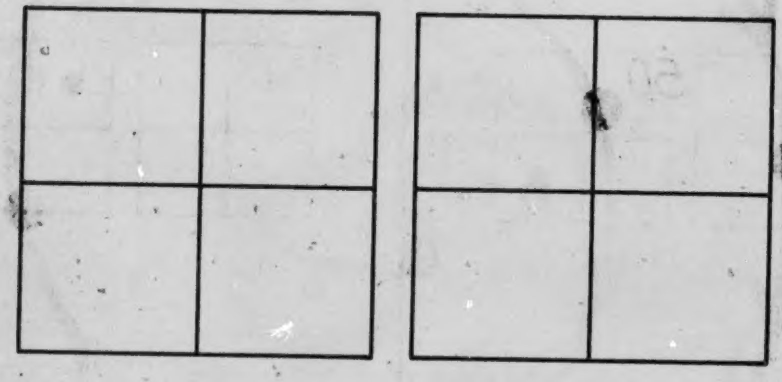
Label the dots.



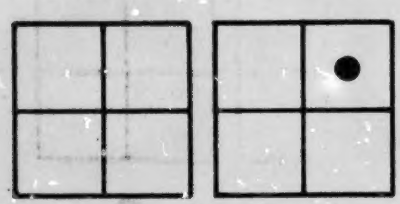
Name ____________________

F 41.2 *

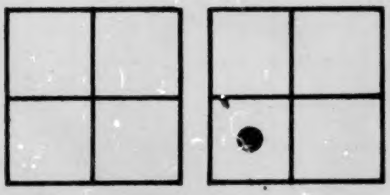
Color this Minicomputer.



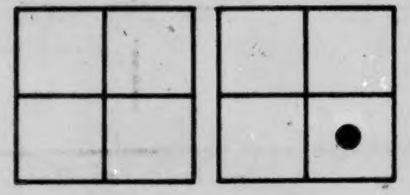
What number is on the Minicomputer?



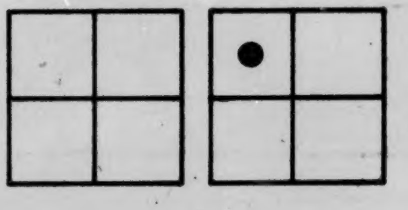
____



____



____



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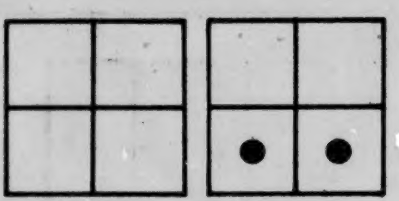

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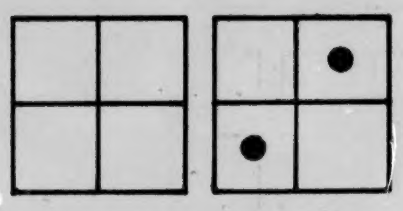

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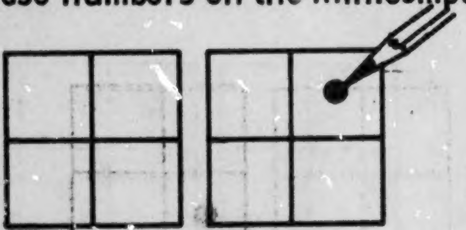
Name ______________________________

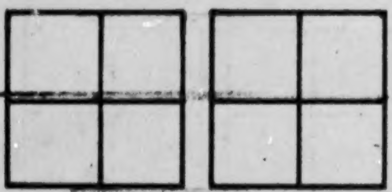
F41.2 **

Put these numbers on the Minicomputer. The first one is done for you.

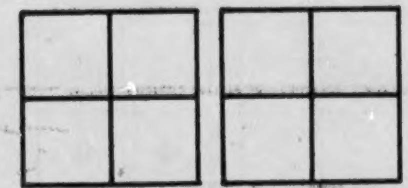


4

8

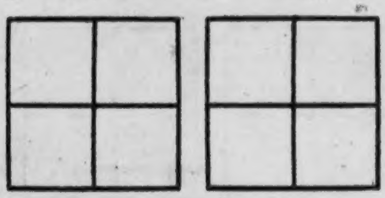


2

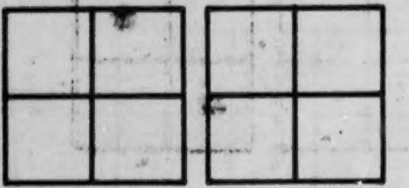


1

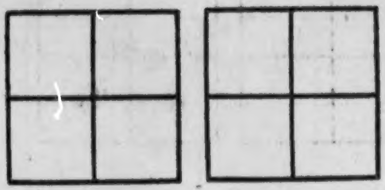
3



7

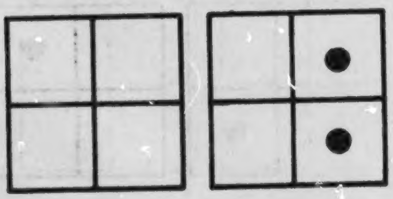


6

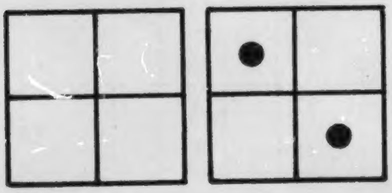


5

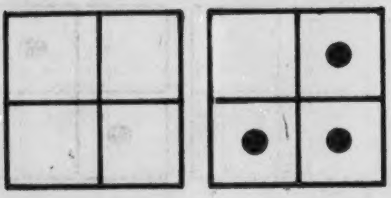
What number is on the Minicomputer?



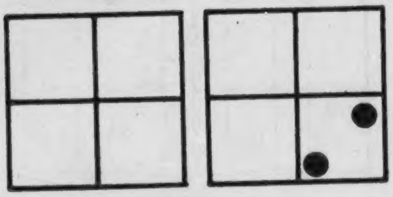
____



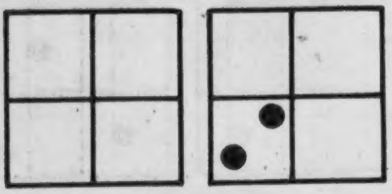
____



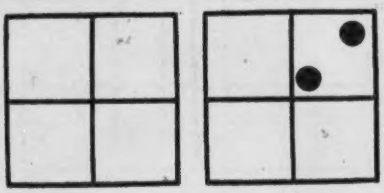
____



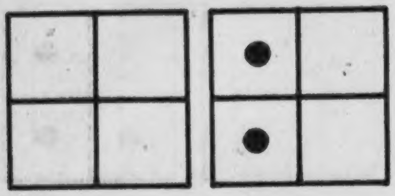
____



____



____



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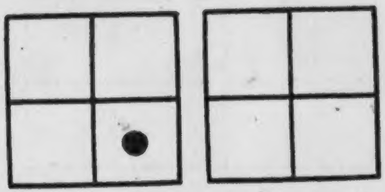

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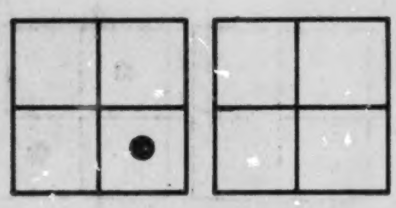
Name ______________________

F 41.2 ***

What number is on the Minicomputer?



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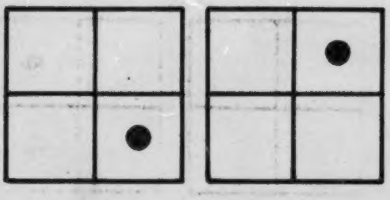

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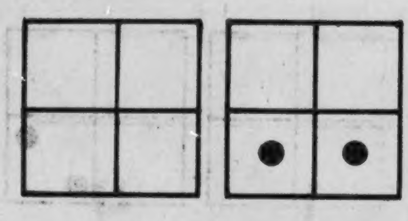

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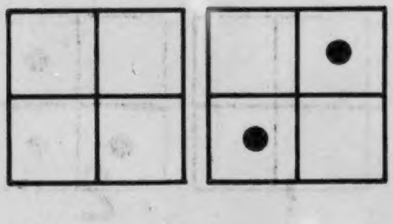

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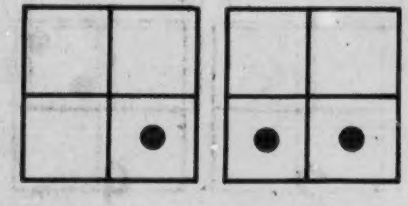

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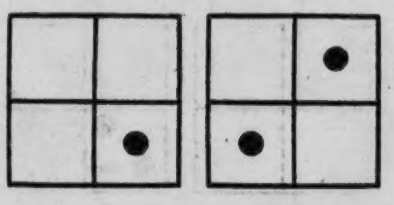

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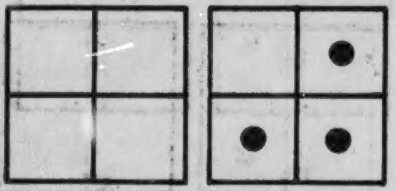

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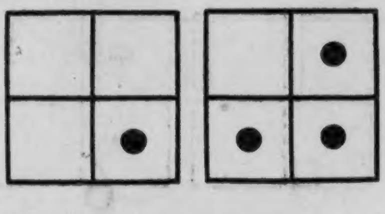

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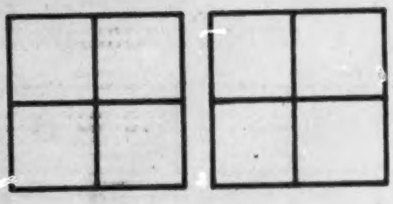
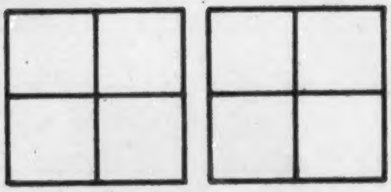
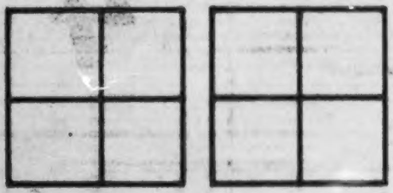
Put these numbers on the Minicomputer.



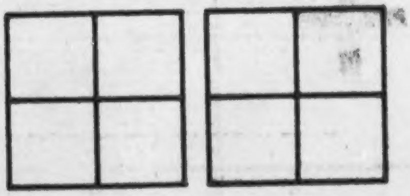
1 8



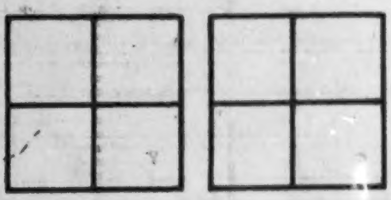
1 1



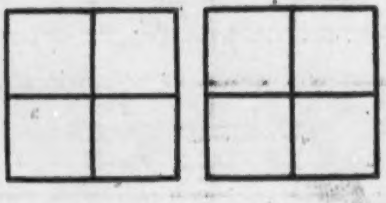
1 2



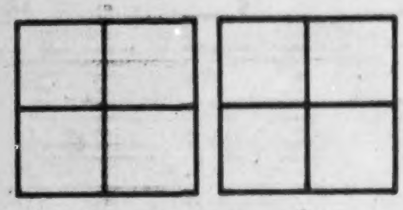
1 4



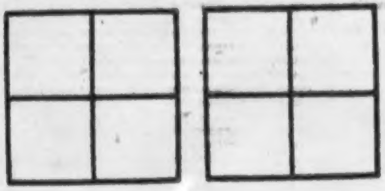
1 7



2 9



4 6

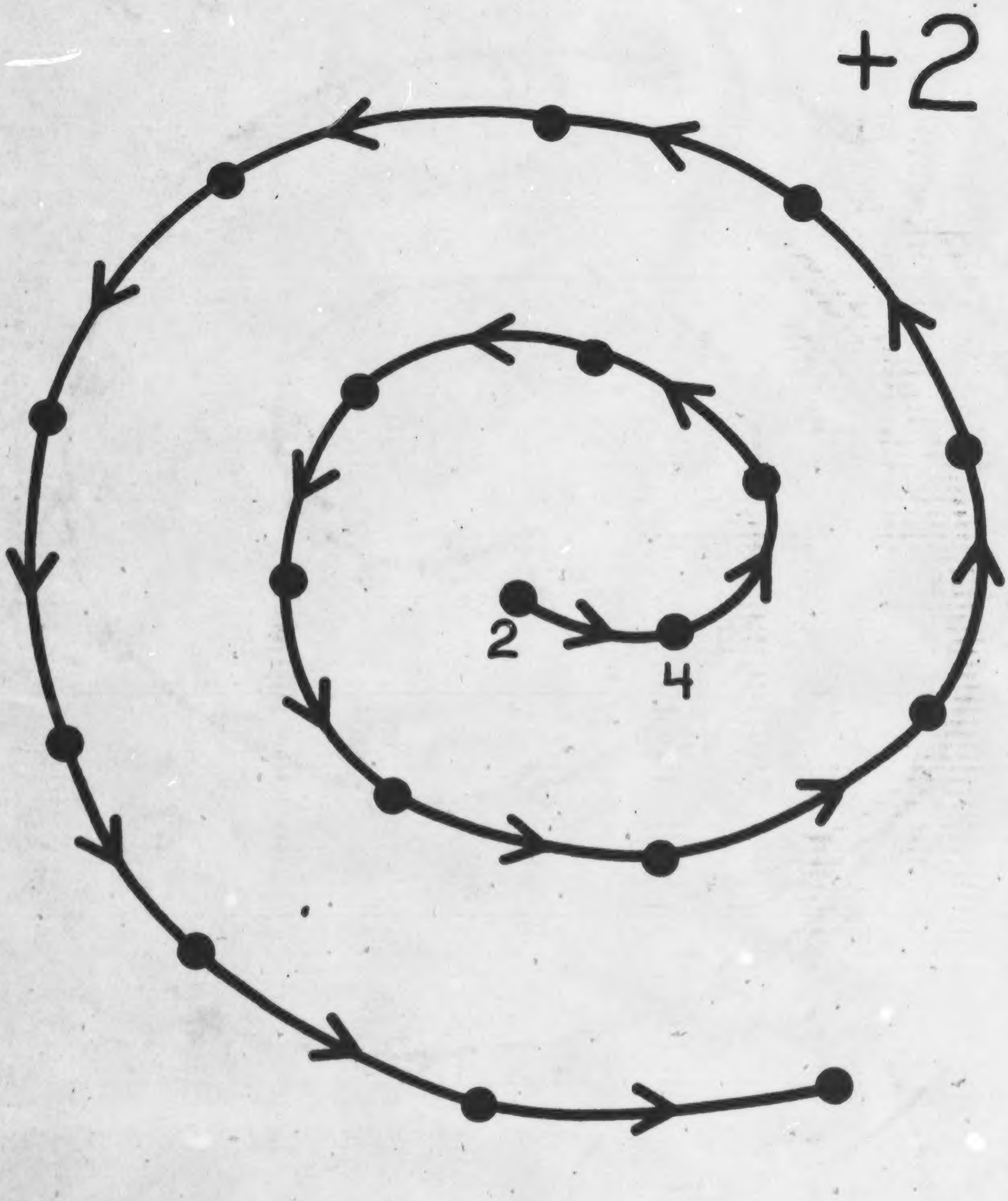


2 5

Name ______________________

F 44.2 *

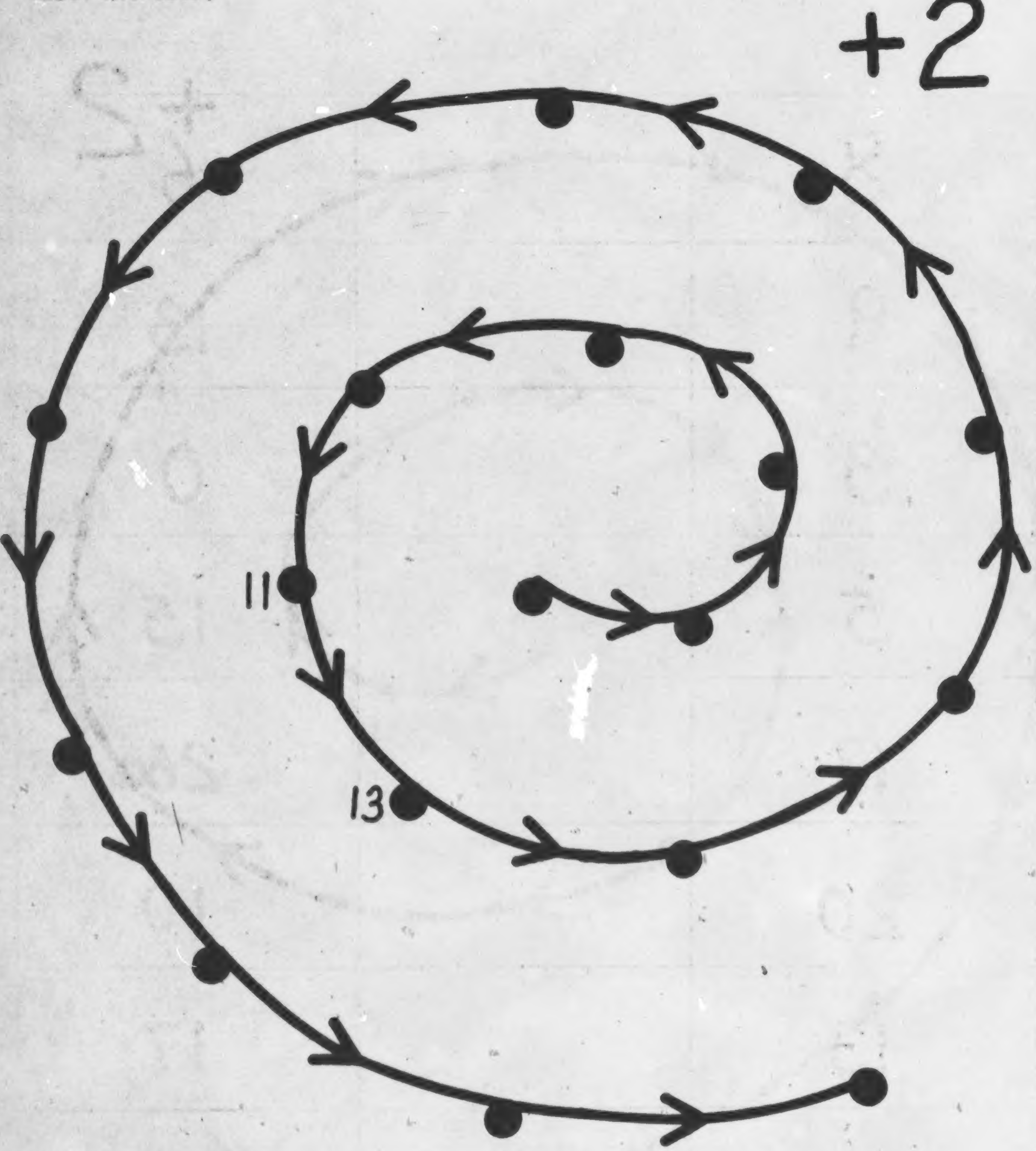
Label the dots.



Name ____________________

F 44.2 **

Label the dots.



Name ______________________

F46.2 *

Write <, >, or =.

8		6
9		13
3		0
5		15
17		26
20		10
13		17
3		20

Name ______________________

F46.2 **

Write <, >, or = .

2+2		3
6		5+3
2+3		6
7+2		9
5		4+2
3+3		7
9		4+4
0+4		4

Name ____________________

F46.2 ***

Write <, >, or =.

3+2		2+3
2+6		5+4
3+3		4+1
6+5		6+6
10+2		9+3
3+8		4+8
12+3		13+2
11+5		12+2

Name ______________________ **F46.2 ******

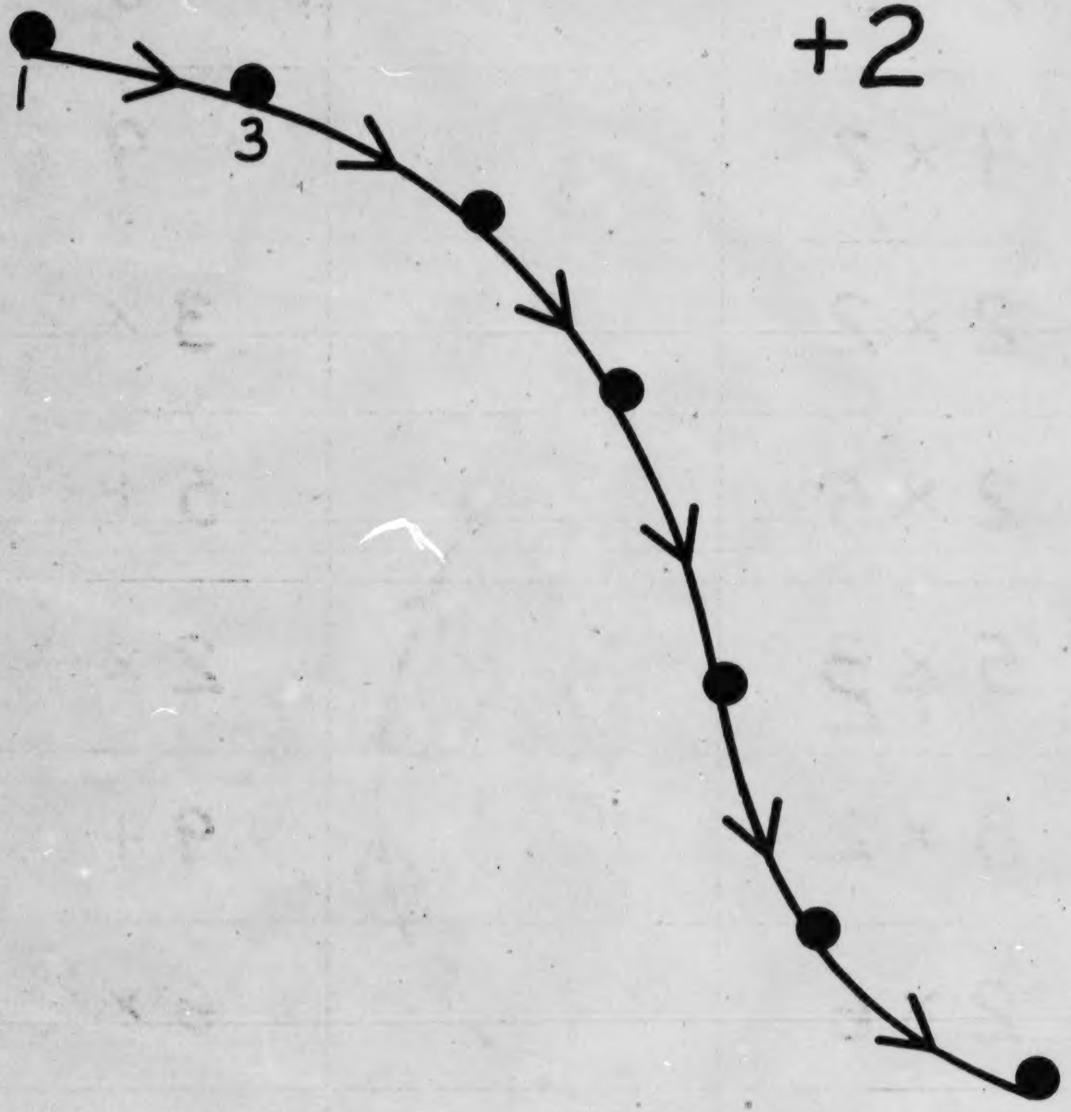
Write <, >, or = .

2 × 3		5
4 × 2		9
2 × 2		3 × 2
2 × 5		5 + 5
5 × 3		2 × 4
8 × 2		9 + 5
2 × 6		6 × 2
3 × 0		3 + 0

Name ______________________________

F 48.2 *

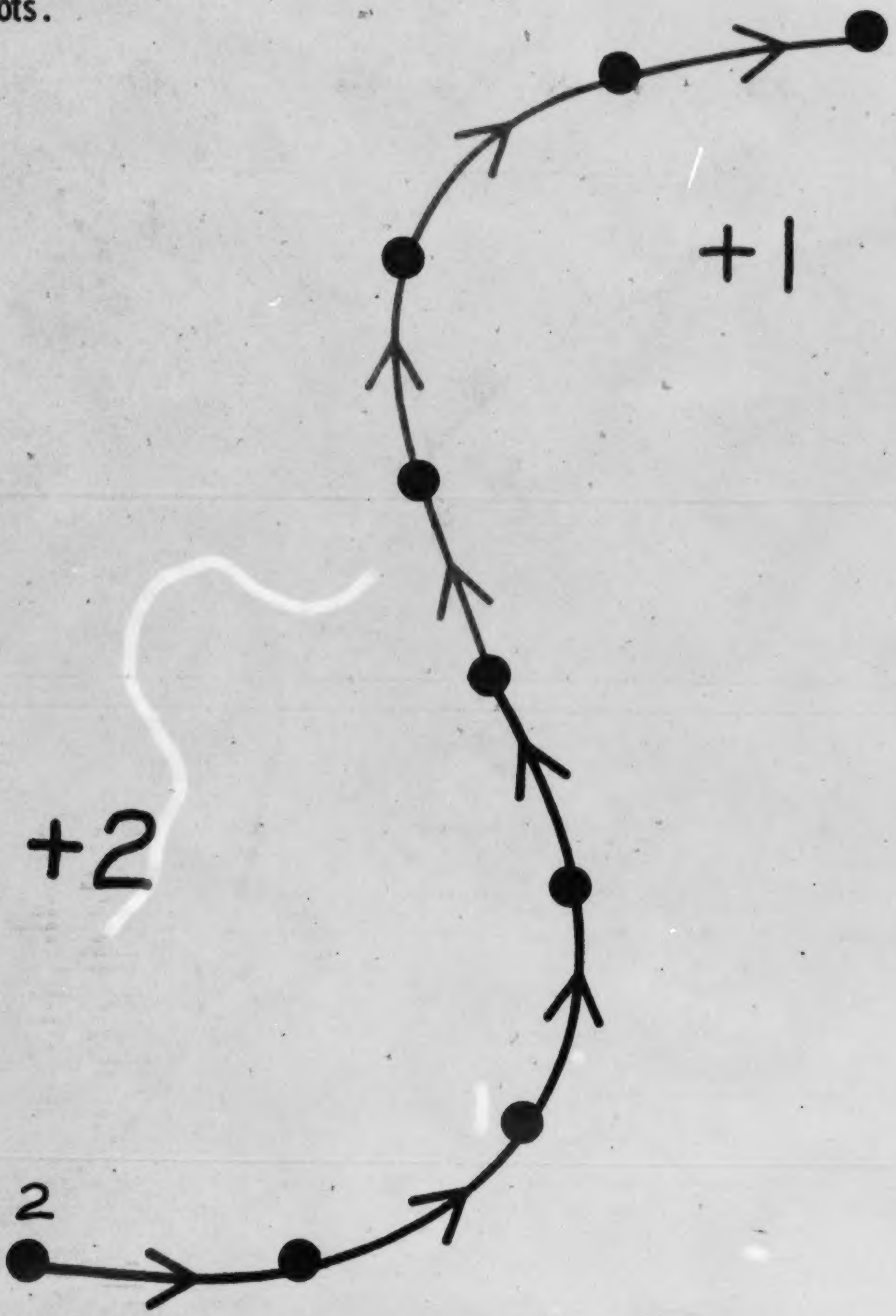
Label the dots.



Name ________________________

F48.2 **

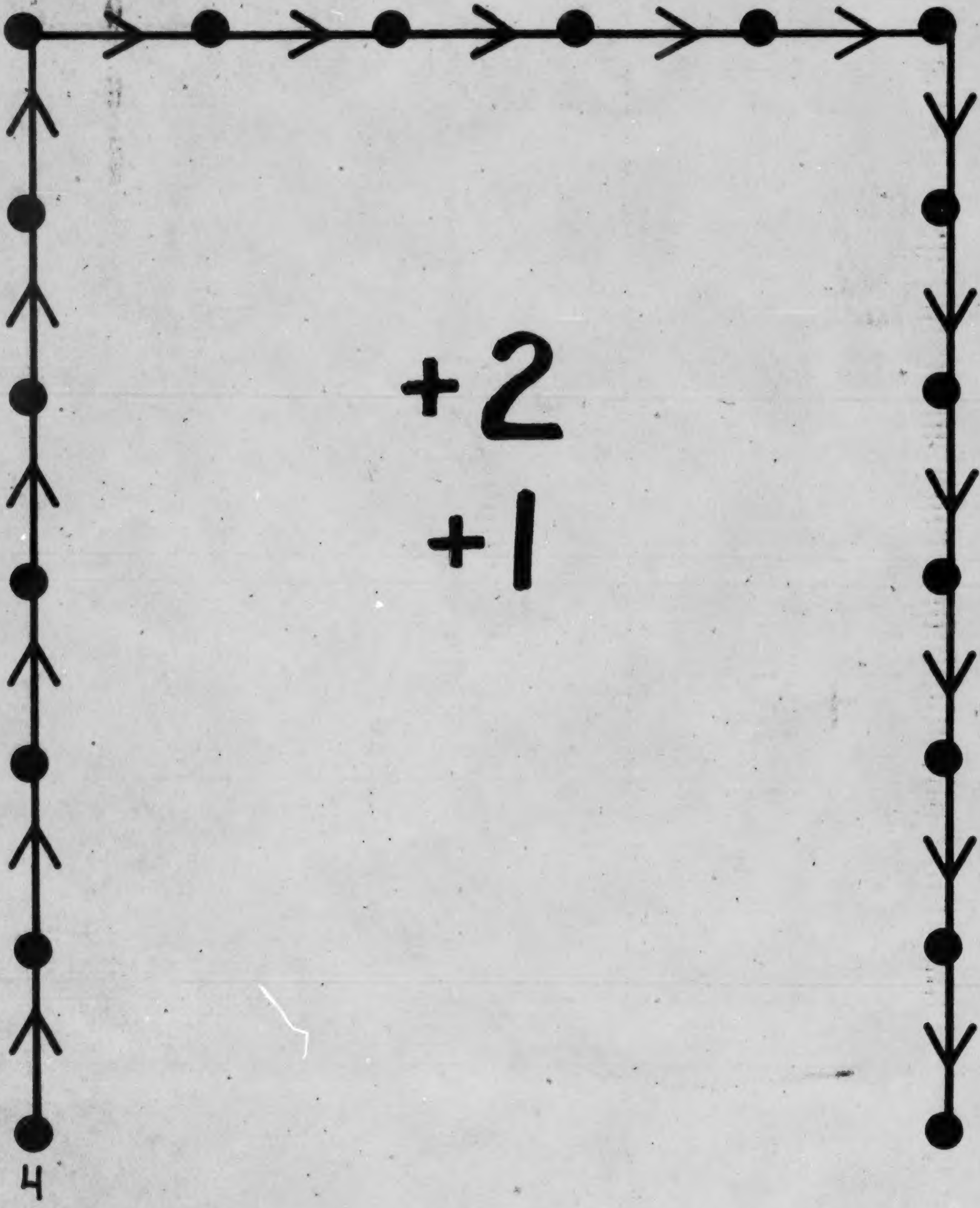
Label the dots.



Name ______________________

F48.2 ***

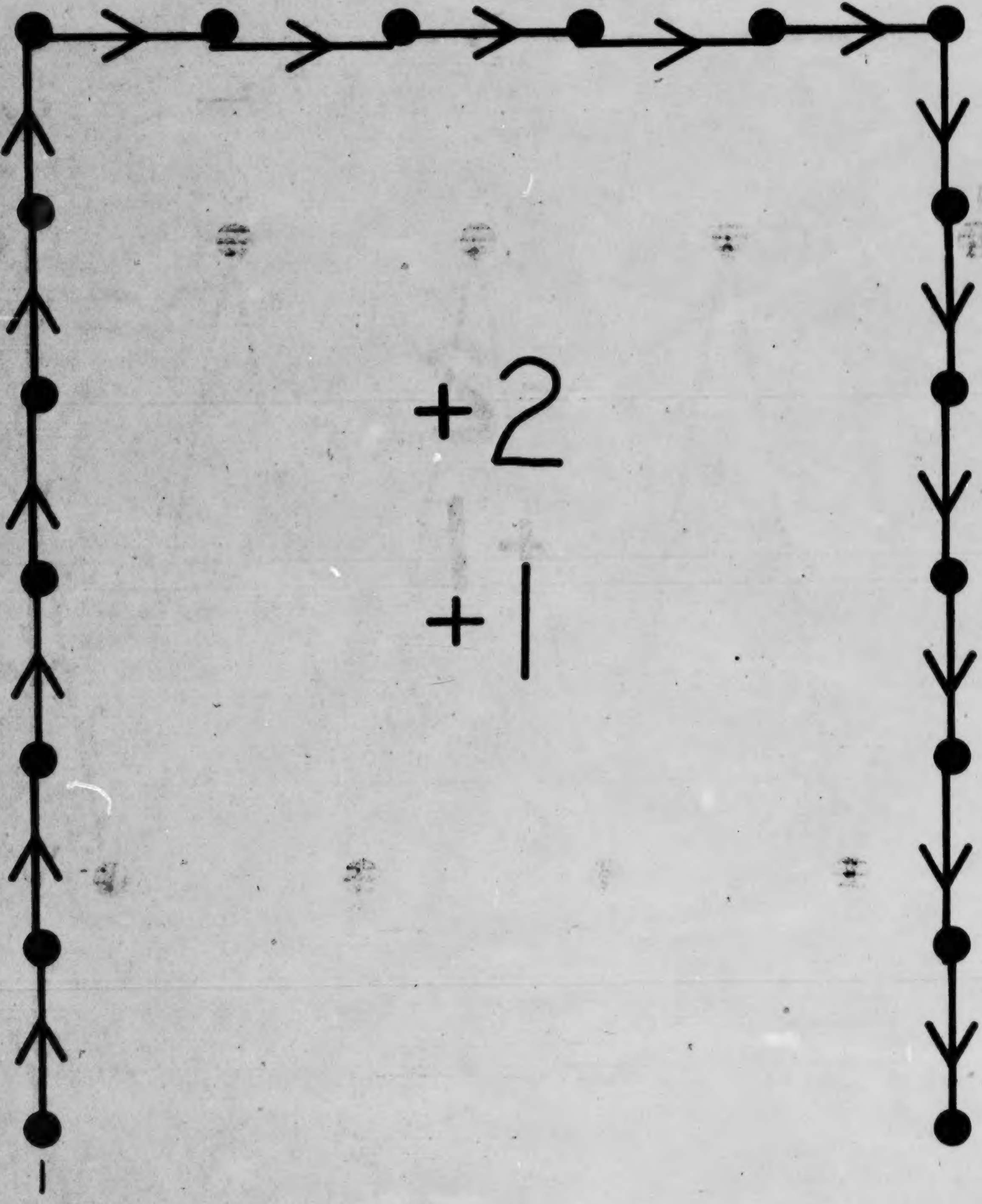
Label the dots.



Name

F48.2 ****

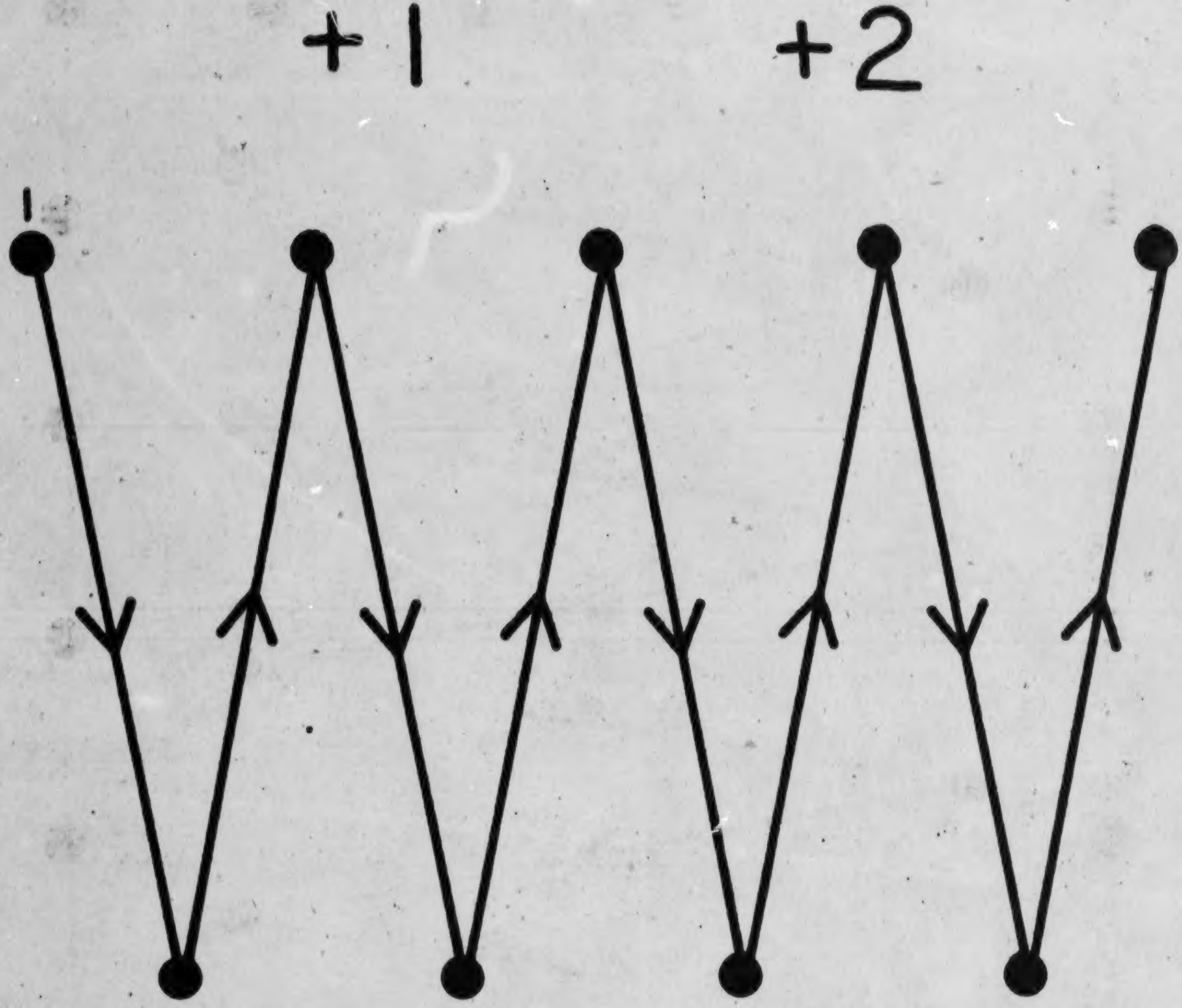
Label the dots.



Name ____________________

F52.2 *

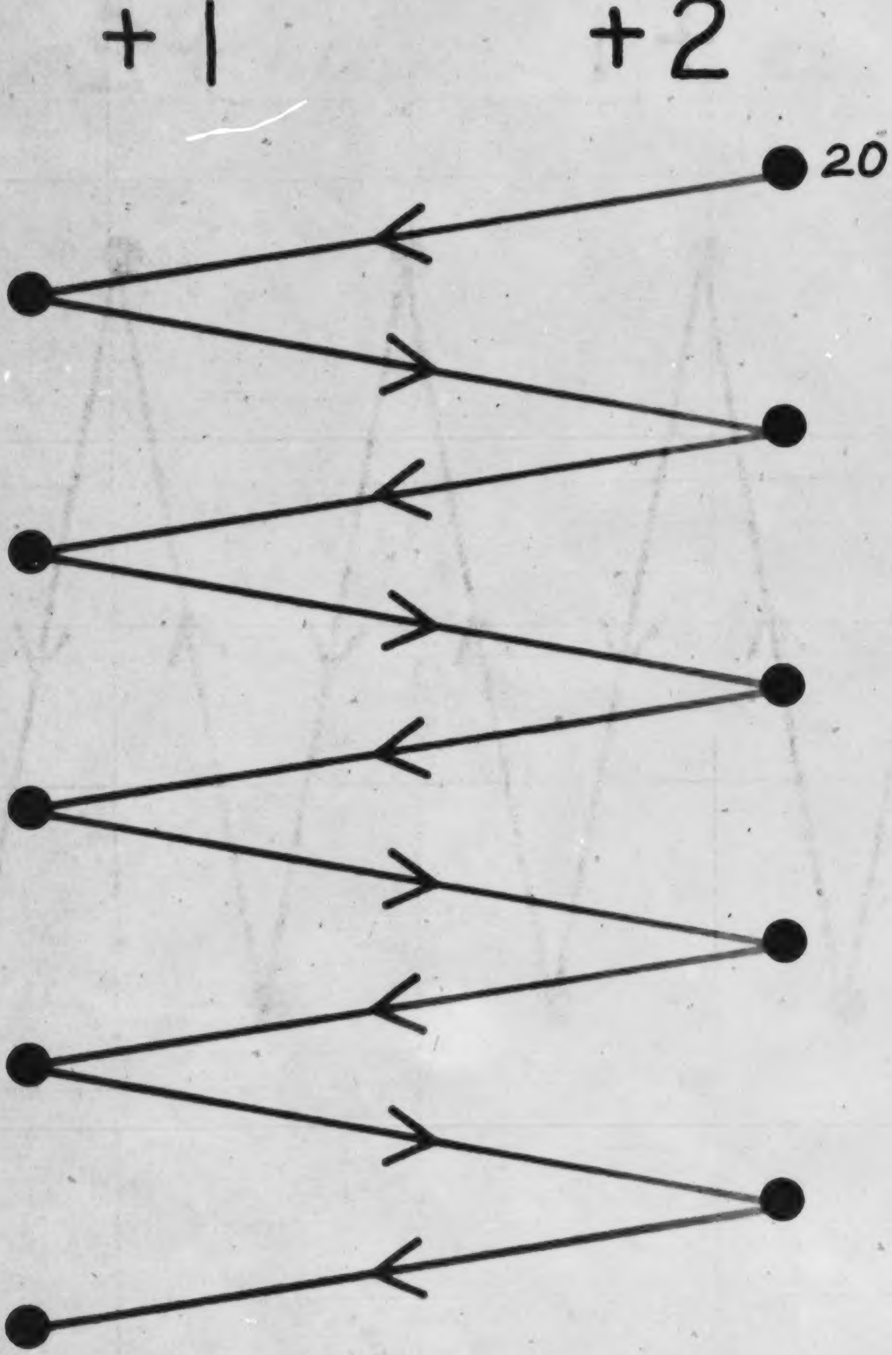
Label the dots. Draw all the +2 arrows.



Name ______________________

F 52.2 **

Label the dots. Draw all the +2 arrows.



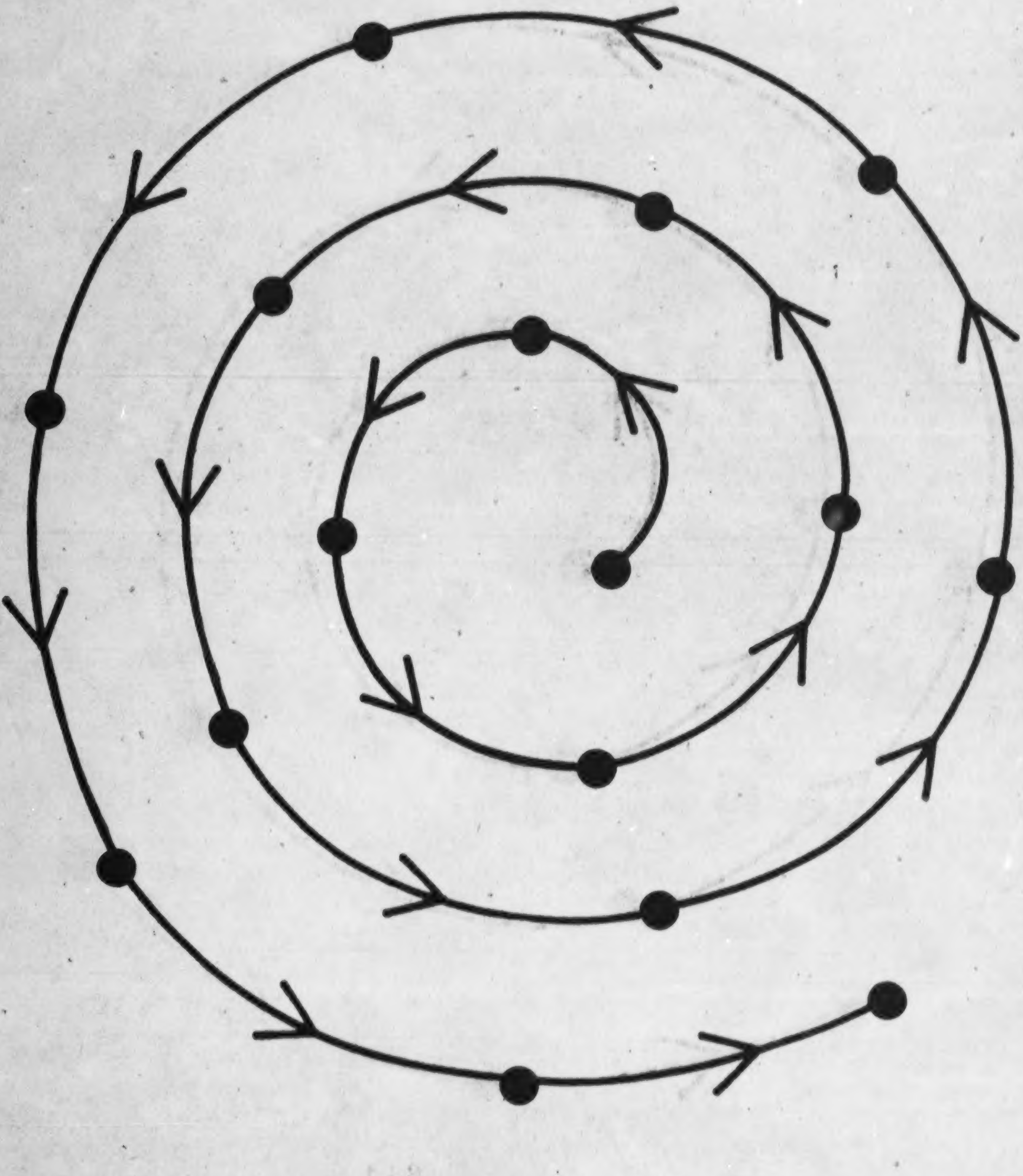
Name ______________________________

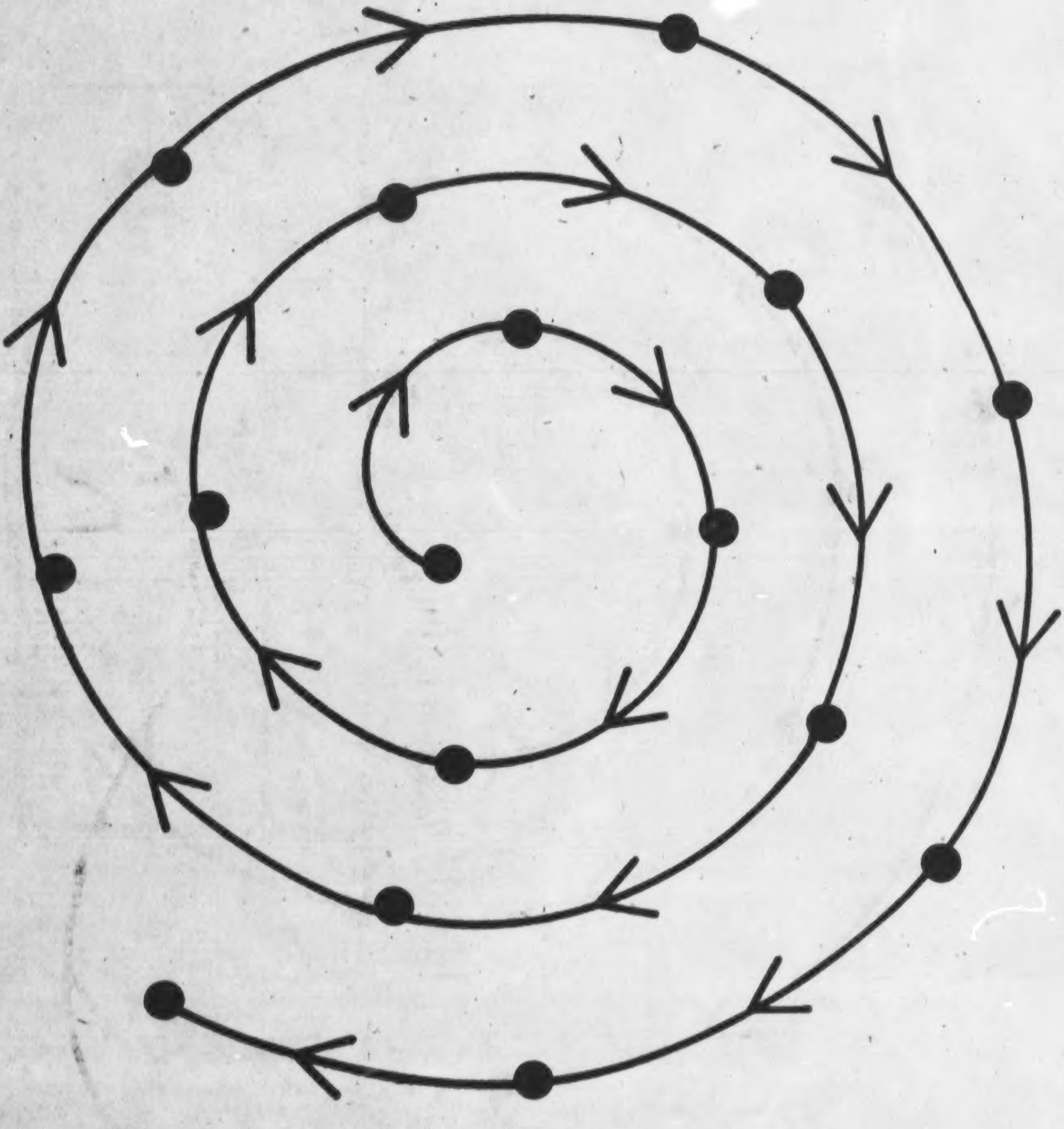
F 57.2

	□	○	△
■			
░			
■			
▒			

Name ____________________

F59





Name ______________________

F 61.2

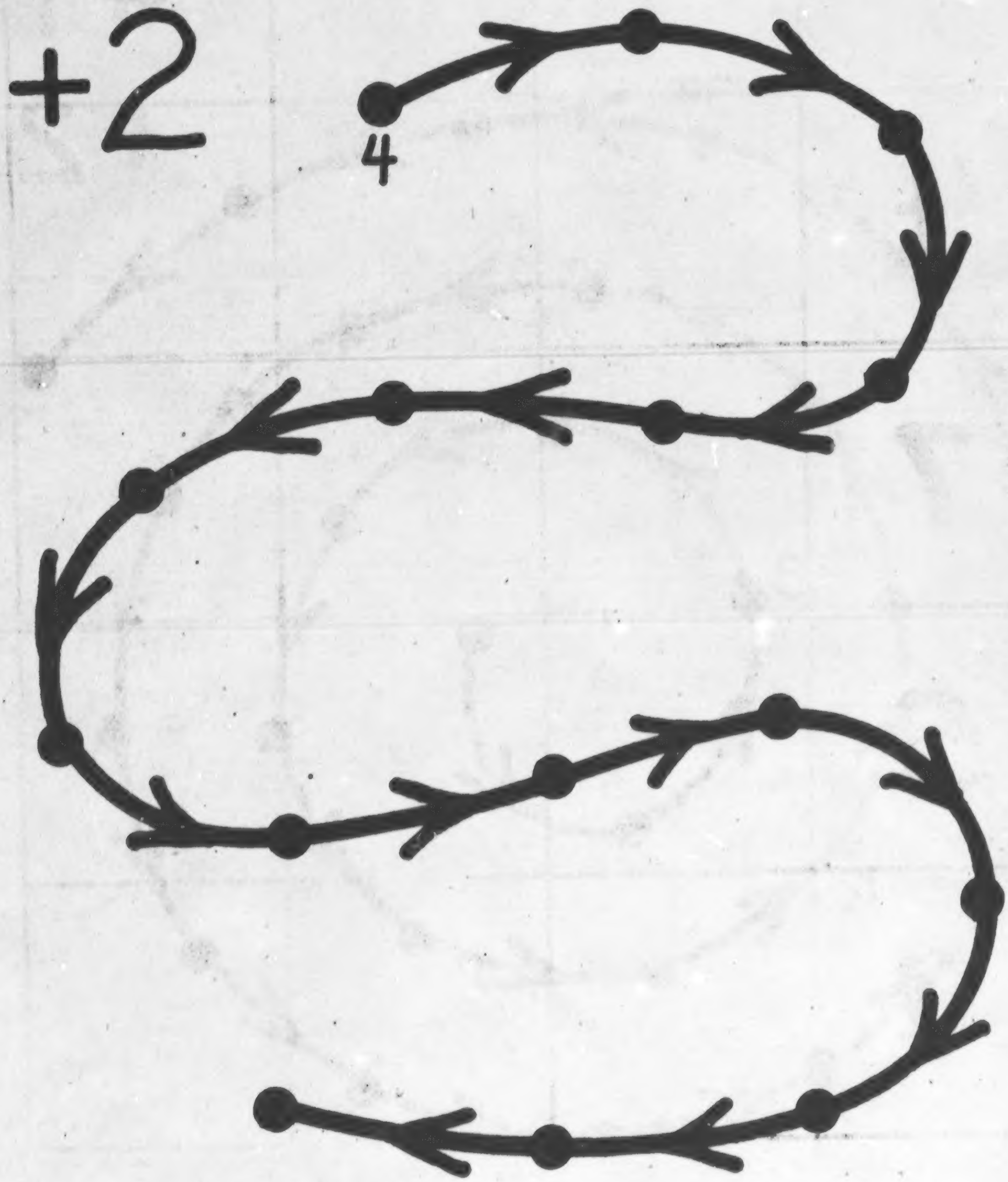
+	1	2	4
3			
5			

+	2	6	8
4			
7			
5			
9			

Name ______________________

F 63.2 *

Label the dots.



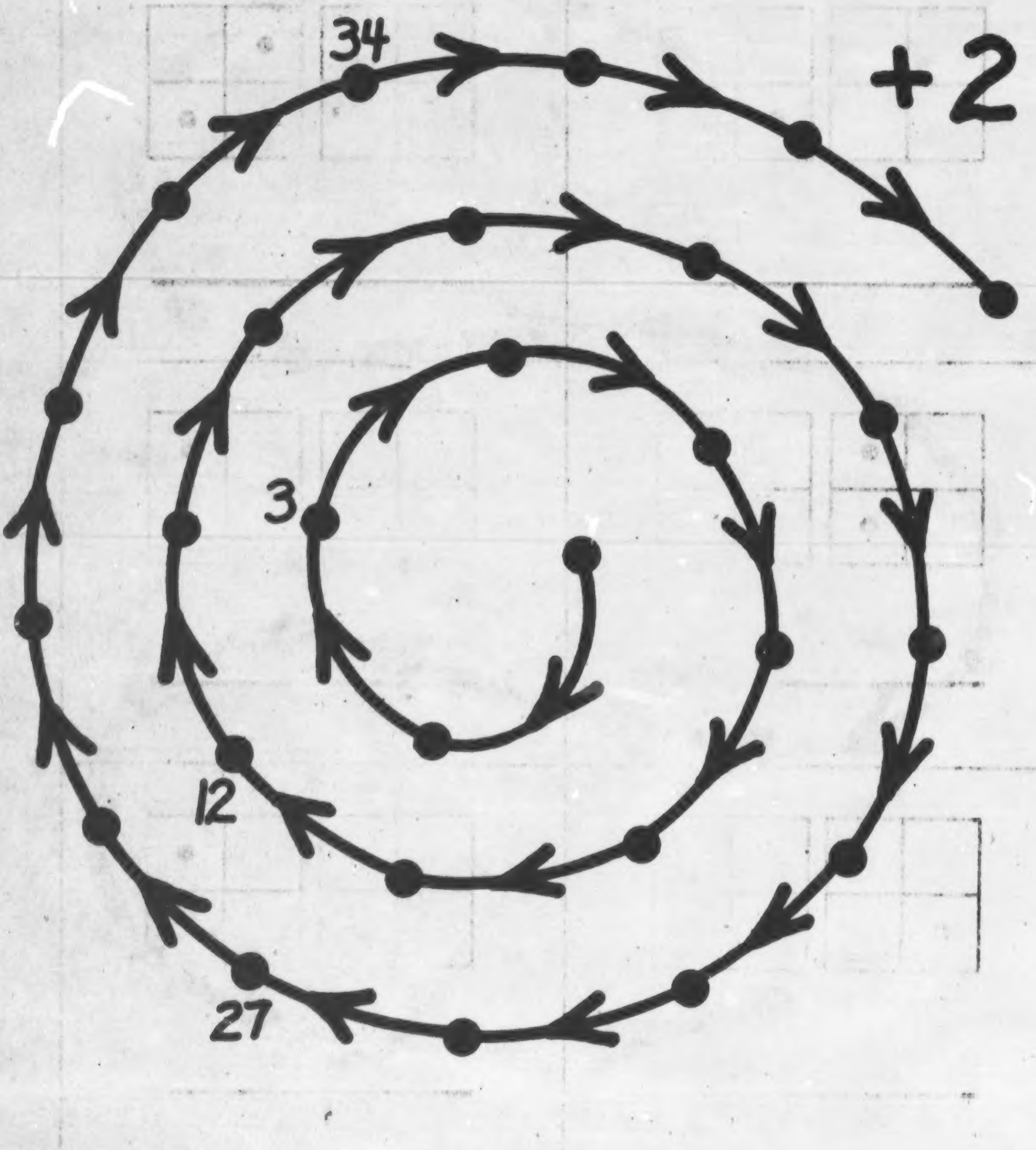
Name ______________________

F 63.2 **

Label the dots.

+1

+2



Name ________________________________ **F 66** *

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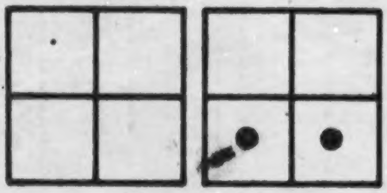

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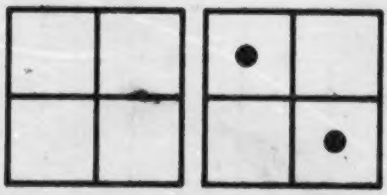

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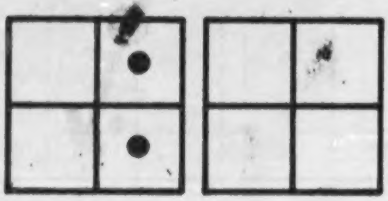

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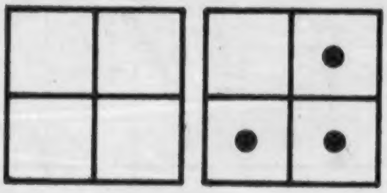

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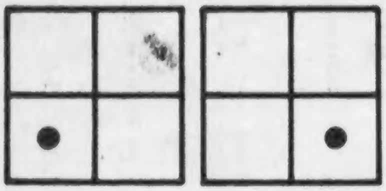

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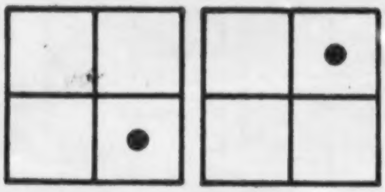

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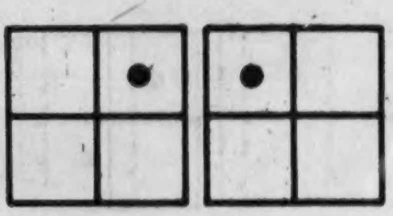

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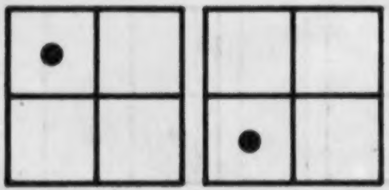

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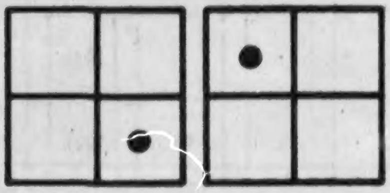

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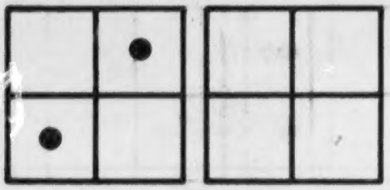

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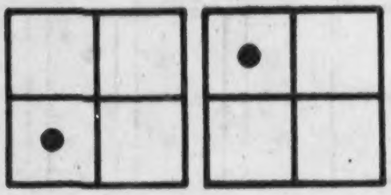

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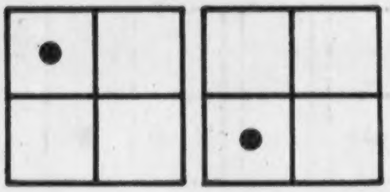

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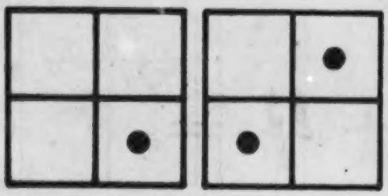
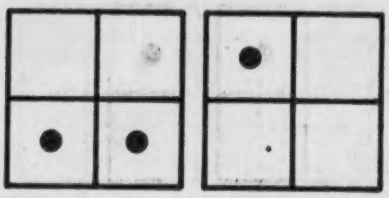
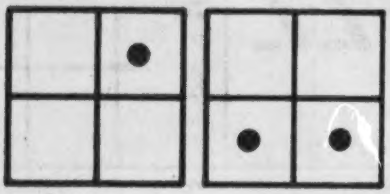
Name ____________________

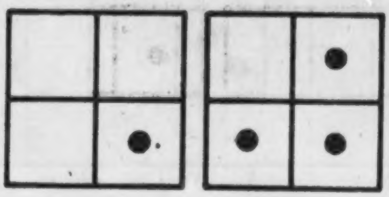
F 66 **

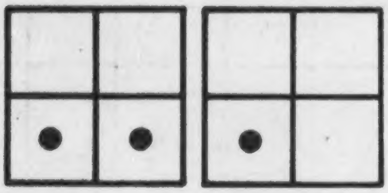
What number is on the Minicomputer?

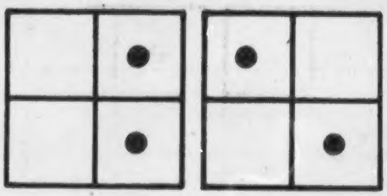




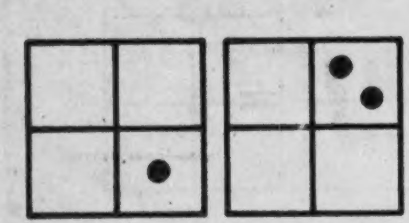




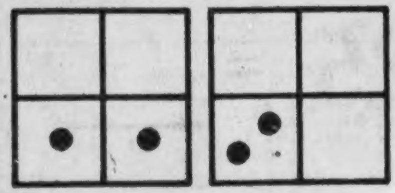




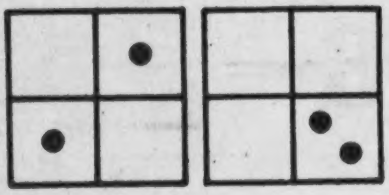
Complete :



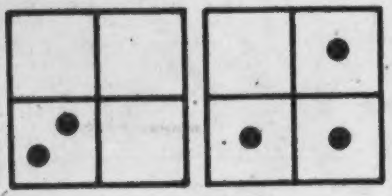
14 + 4 = ____



12 + 22 = ____



41 + 21 = ____

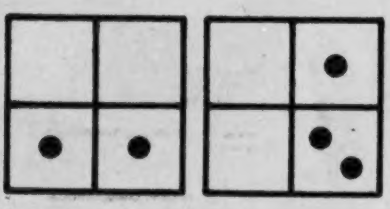


25 + 22 = ____

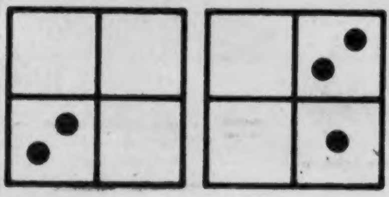
Name ____________________

F 66 ***

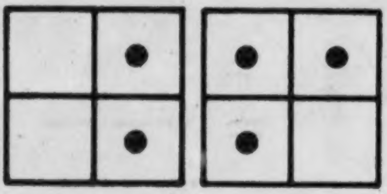
Complete :



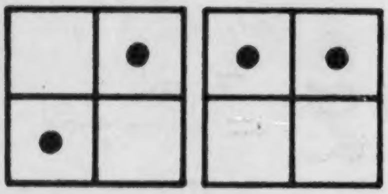
15 + 21 = ____



24 + 25 = ____

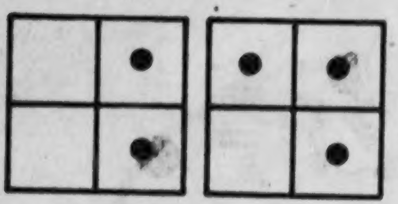


46 + 18 = ____

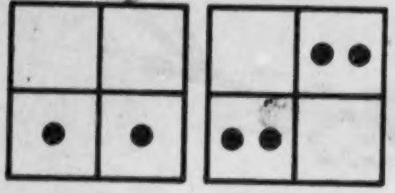


48 + 24 = ____

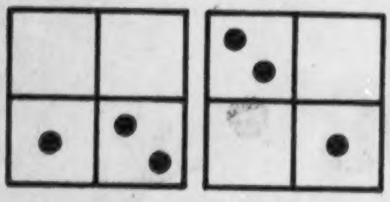
Complete :



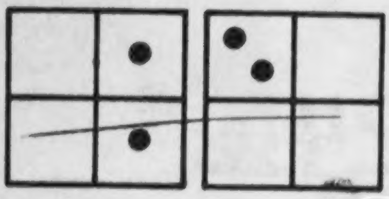
14 + 49 = ____



26 + 16 = ____



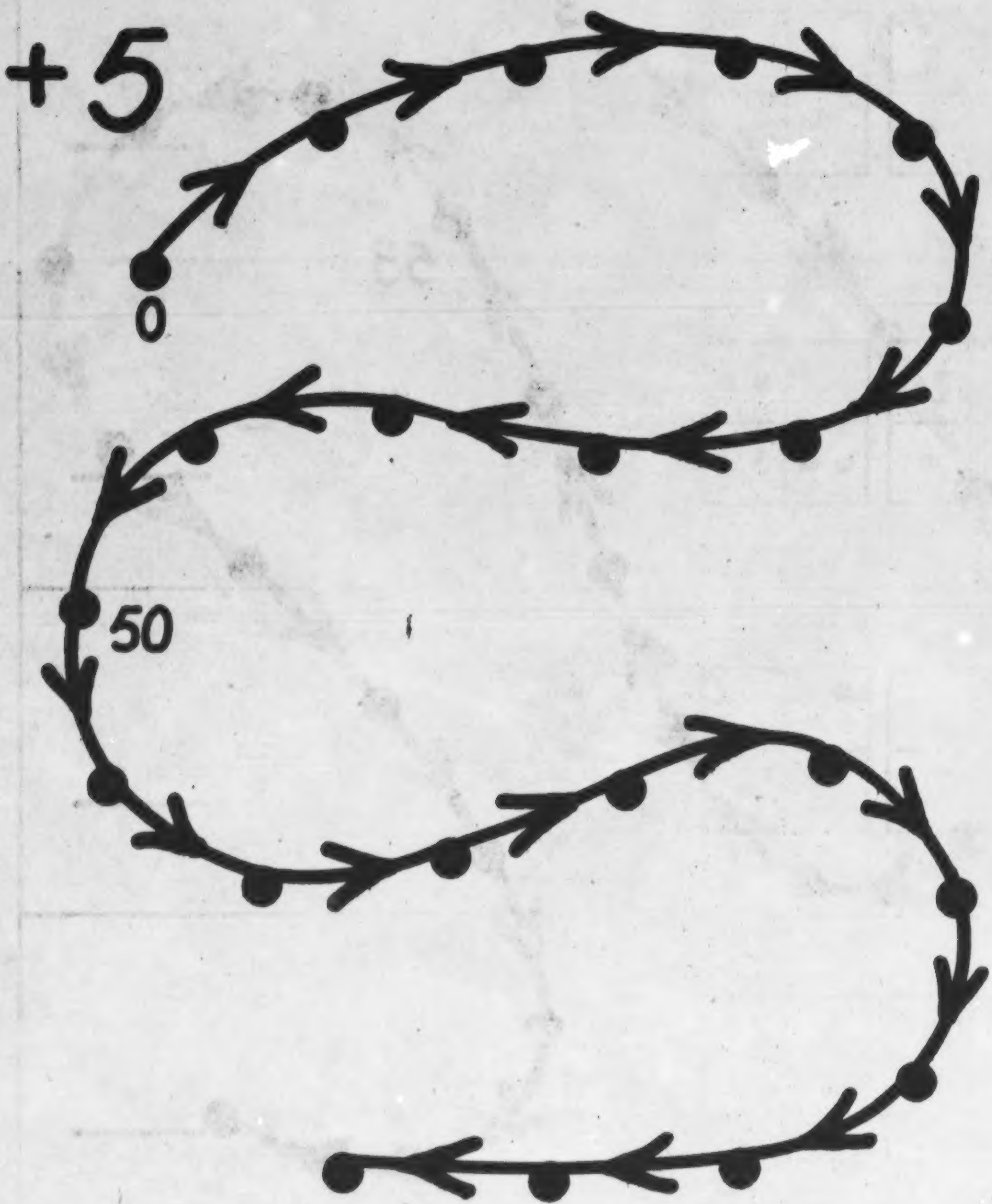
38 + 19 = ____



18 + 48 = ____

Name ______________________ **F 68.2** *

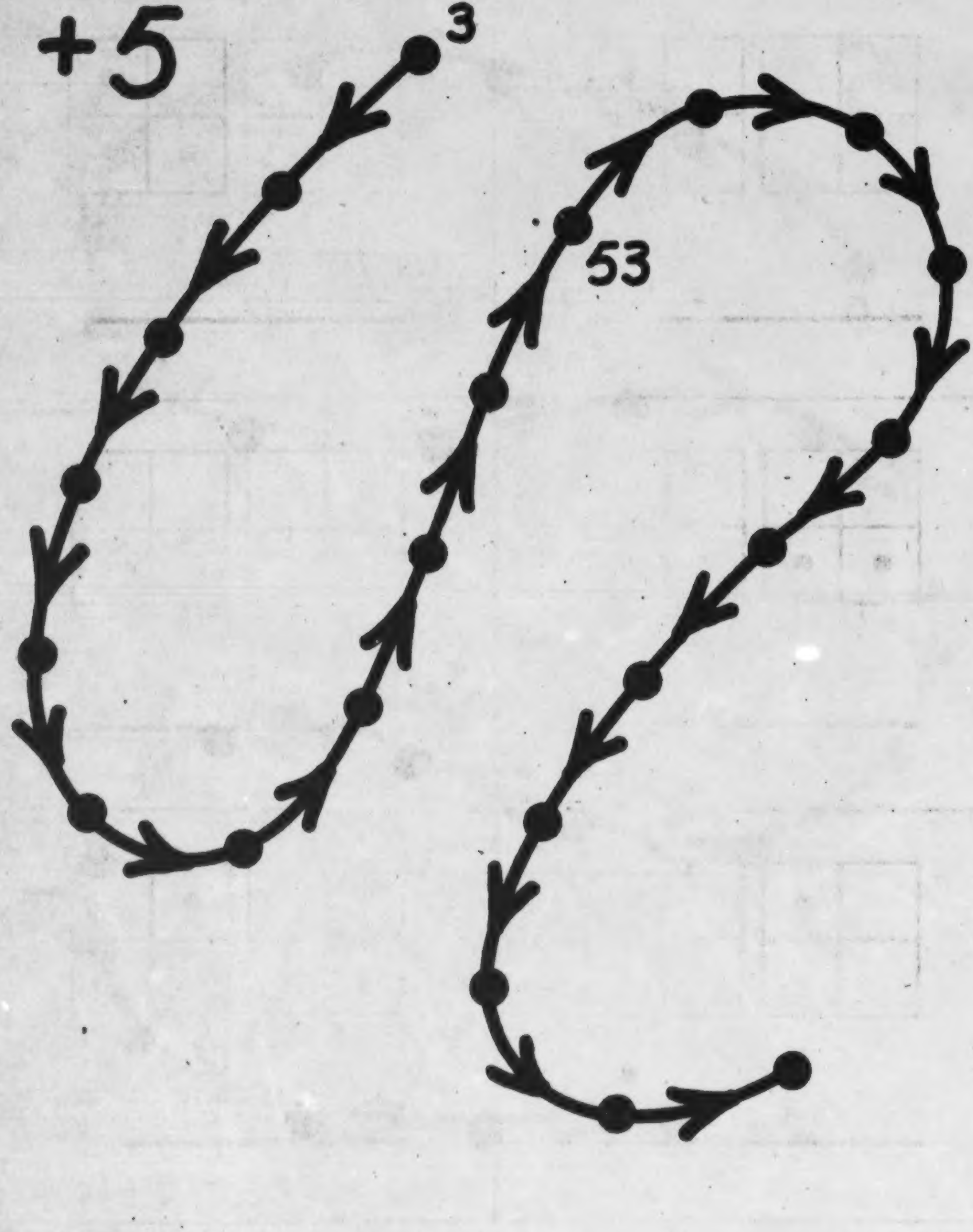
Label the dots.



Name ______________________

F 68.2 **

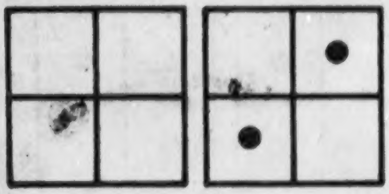
Label the dots.

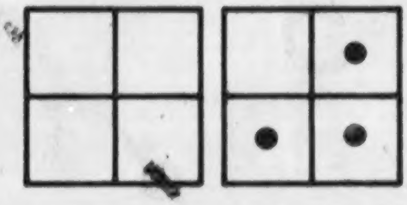


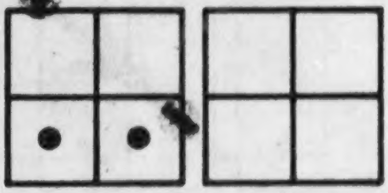
Name

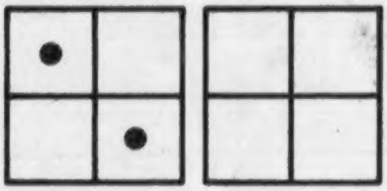
F 71.2 *

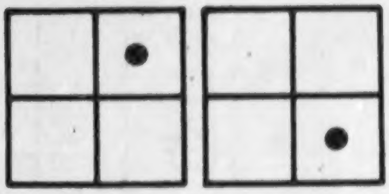
What number is on the Minicomputer?

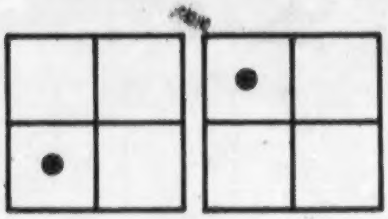












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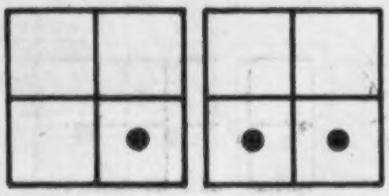
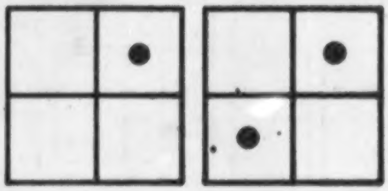
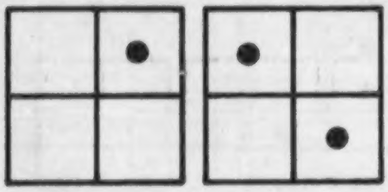
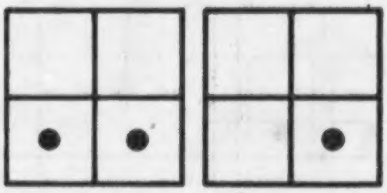
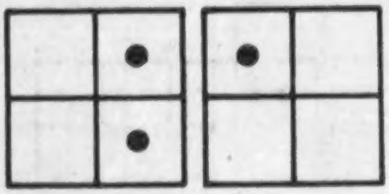
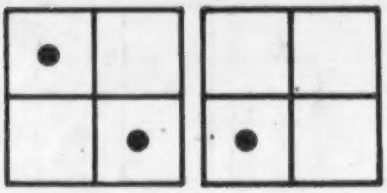








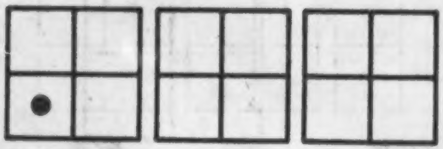




Name ______________________________

F 71.2 **

What number is on the Minicomputer?



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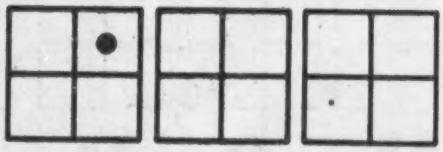

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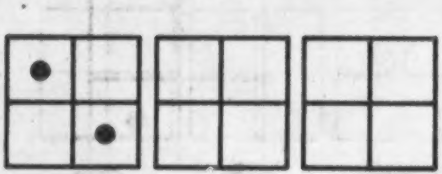

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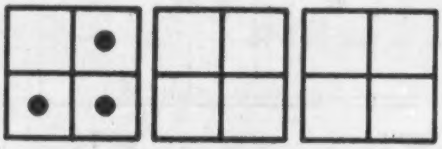

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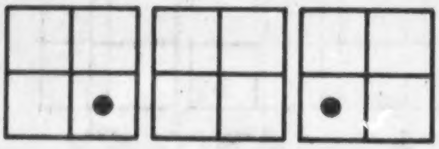

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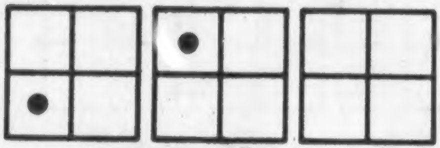

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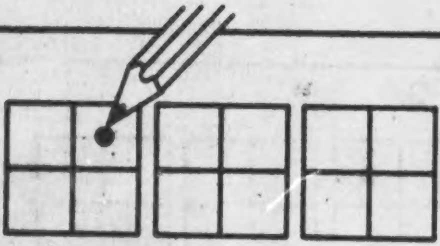
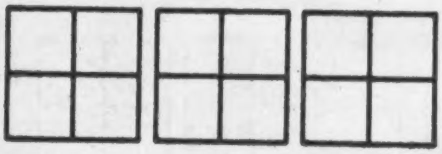


4 0 0



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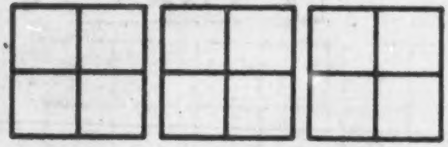
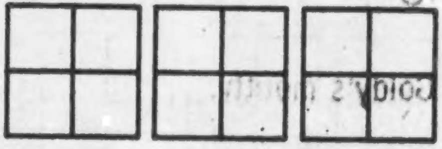


3 0 0



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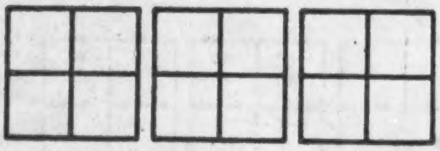
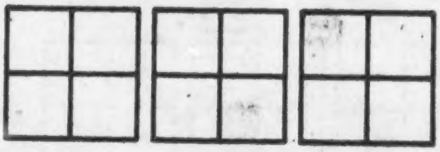


2 0 4

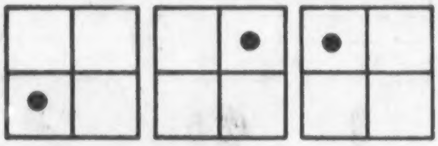


1 2 0

Name ____________________

F 71.2 ***

What number is on the Minicomputer?



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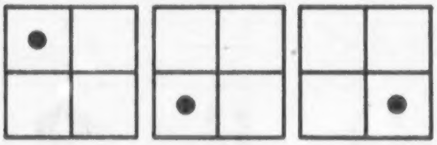

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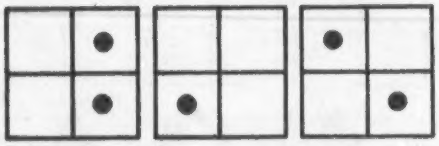

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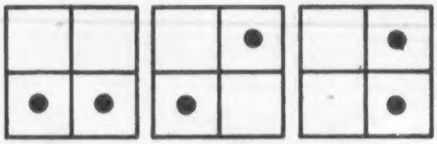

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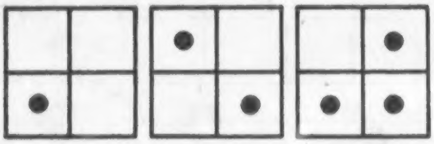

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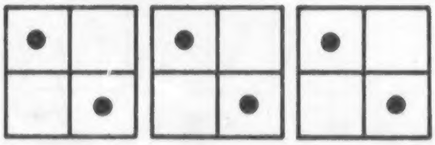

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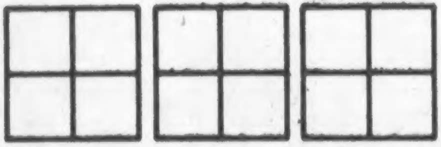
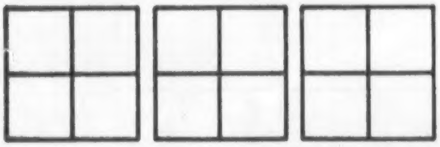
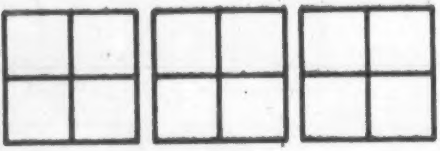
Put these numbers on the Minicomputer.



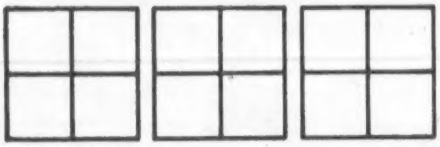
4 4 8



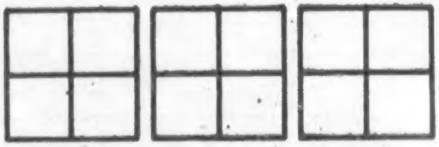
1 8 2



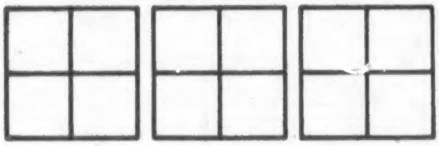
3 5 1



7 0 6



9 3 5



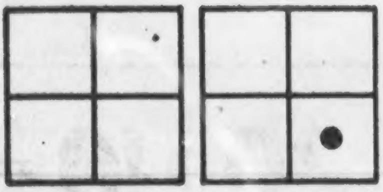
6 2 7

Name ______________________

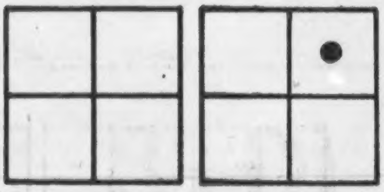
F 74.2 *

Complete :

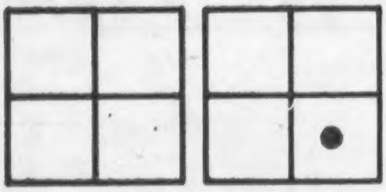
1 + 4 = ____



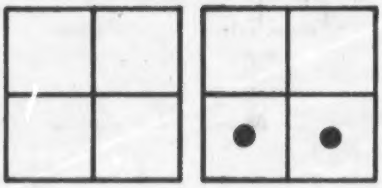
4 + 2 = ____



1 + 8 = ____

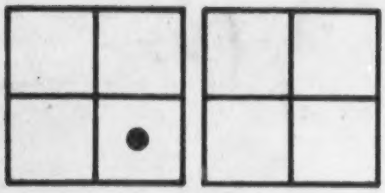


3 + 4 = ____

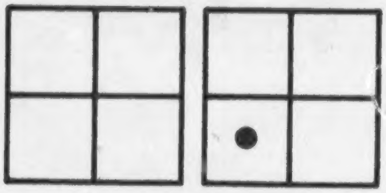


Complete.

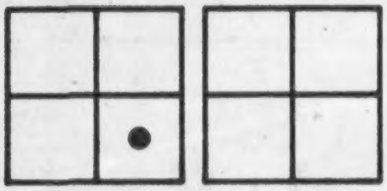
10 + 4 = ___



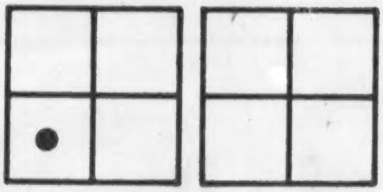
2 + 10 = ___



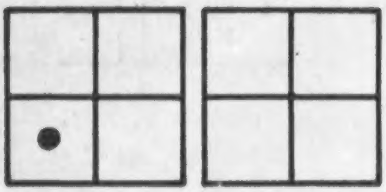
10 + 8 = ___



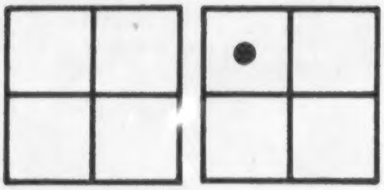
20 + 10 = ___



20 + 2 = ___



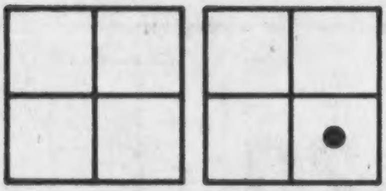
8 + 20 = ___



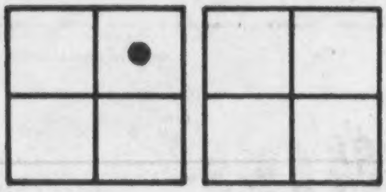
Name ______________________

F 74.2 **

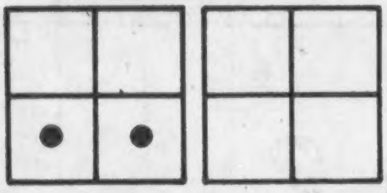
Complete :



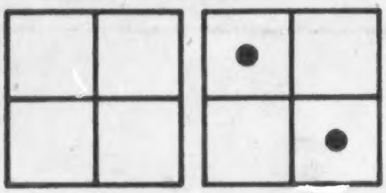
1 + 40 = ____



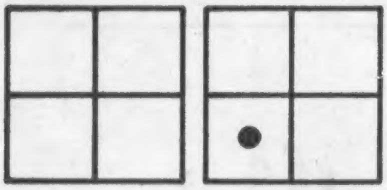
40 + 8 = ____



30 + 4 = ____

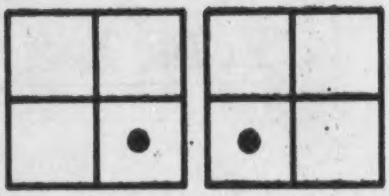


9 + 10 = ____

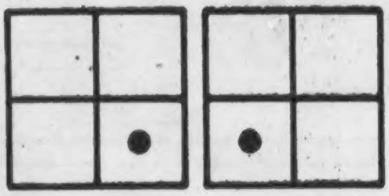


2 + 80 = ____

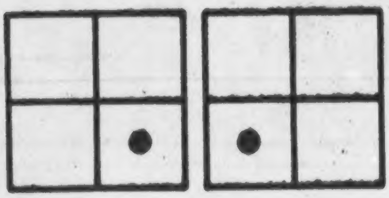
(Continue on the back.)



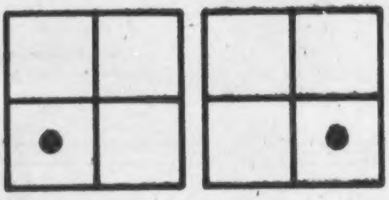
12 + 4 = ____



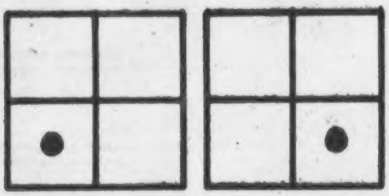
12 + 20 = ____



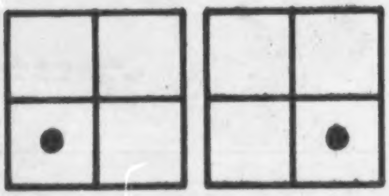
12 + 40 = ____



21 + 2 = ____



21 + 8 = ____

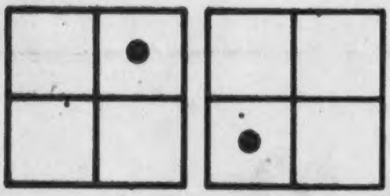


21 + 10 = ____

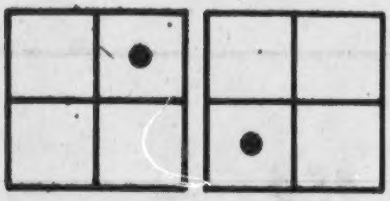
Name ______________________

F 74.2 ***

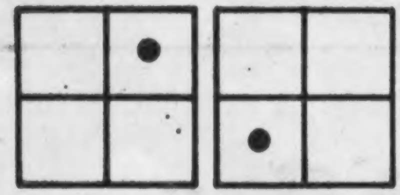
Complete :



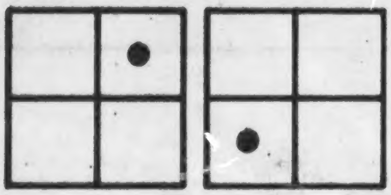
42+5 = ____



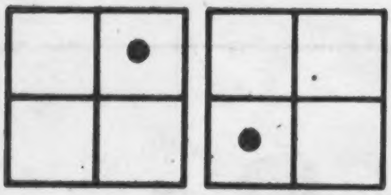
42 + 11 = ____



42 + 14 = ____

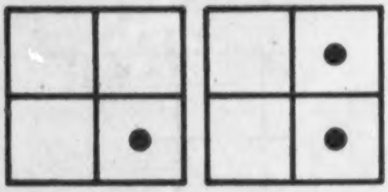


42 + 30 = ____

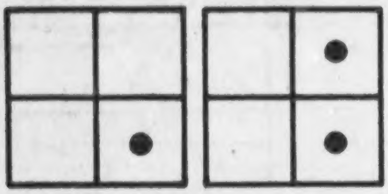


42 + 25 = ____

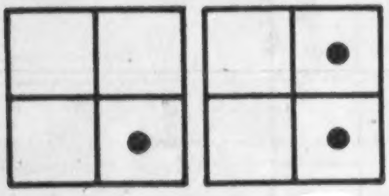
(Continue on the back.)



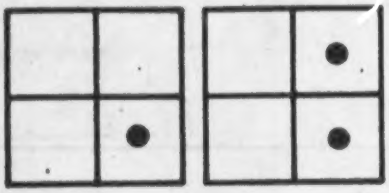
15 + 4 = ____



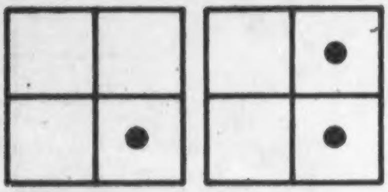
15 + 10 = ____



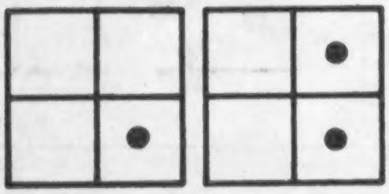
15 + 12 = ____



15 + 50 = ____



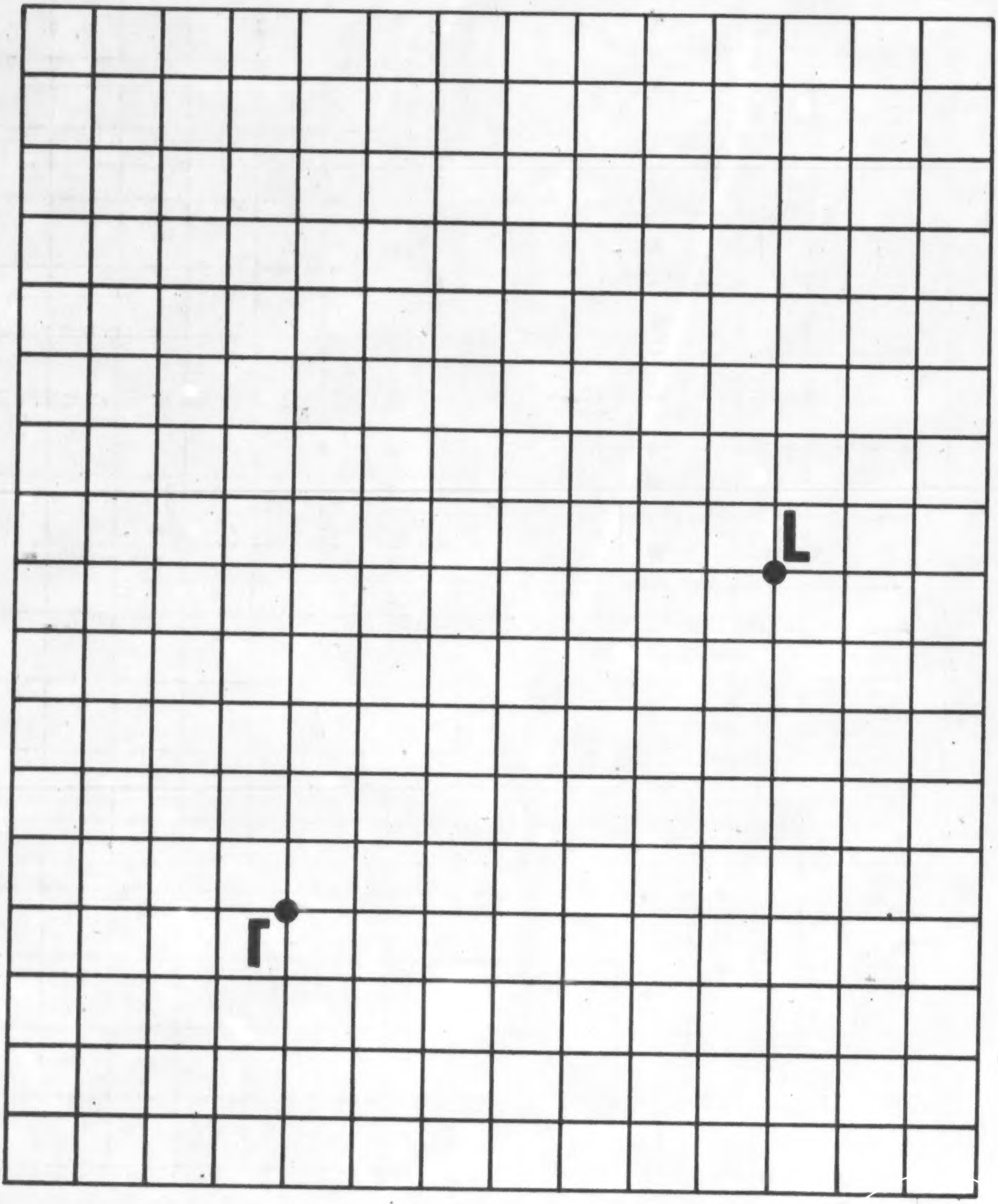
15 + 54 = ____

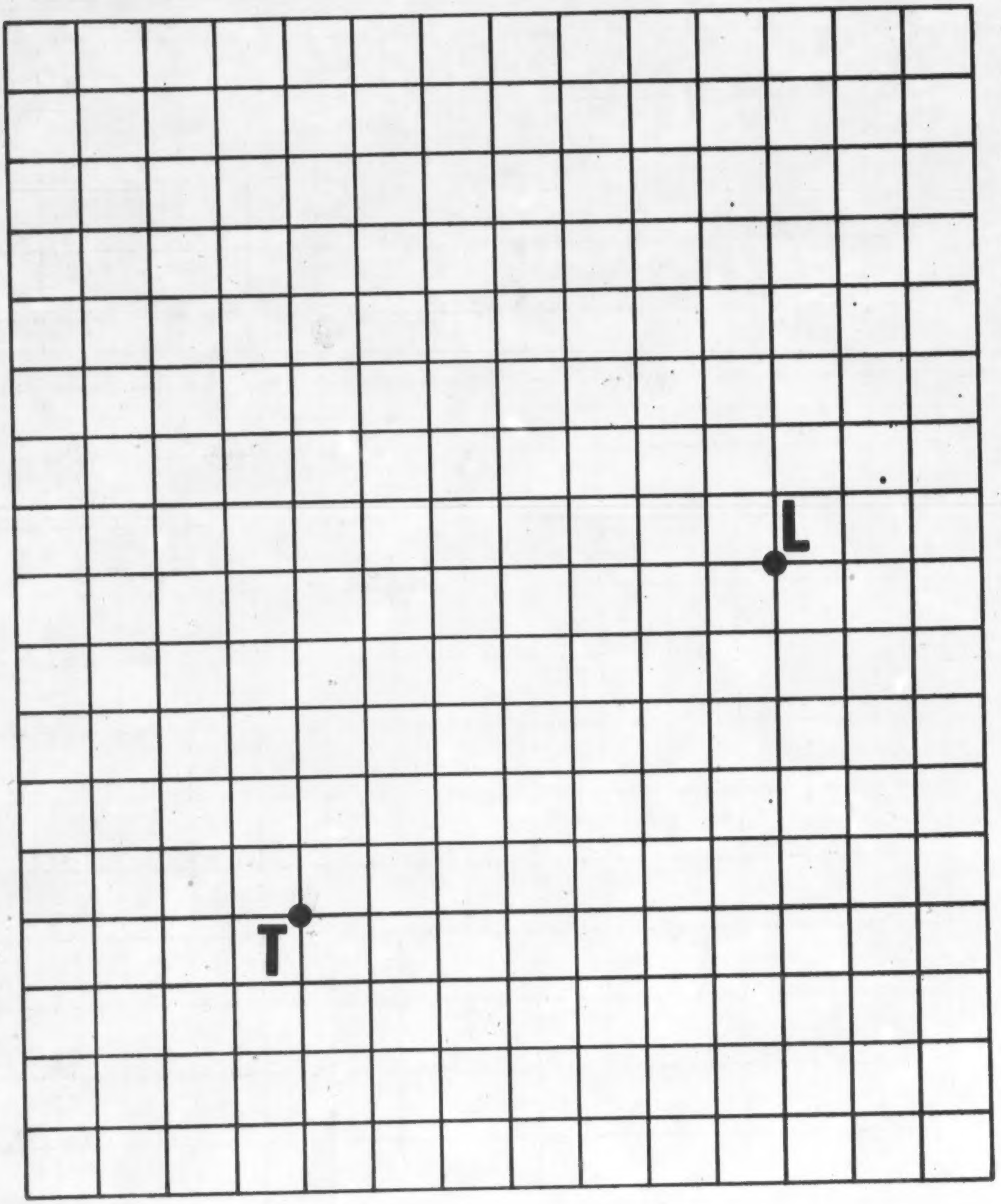


15 + 55 = ____

Name ______________________

F 75

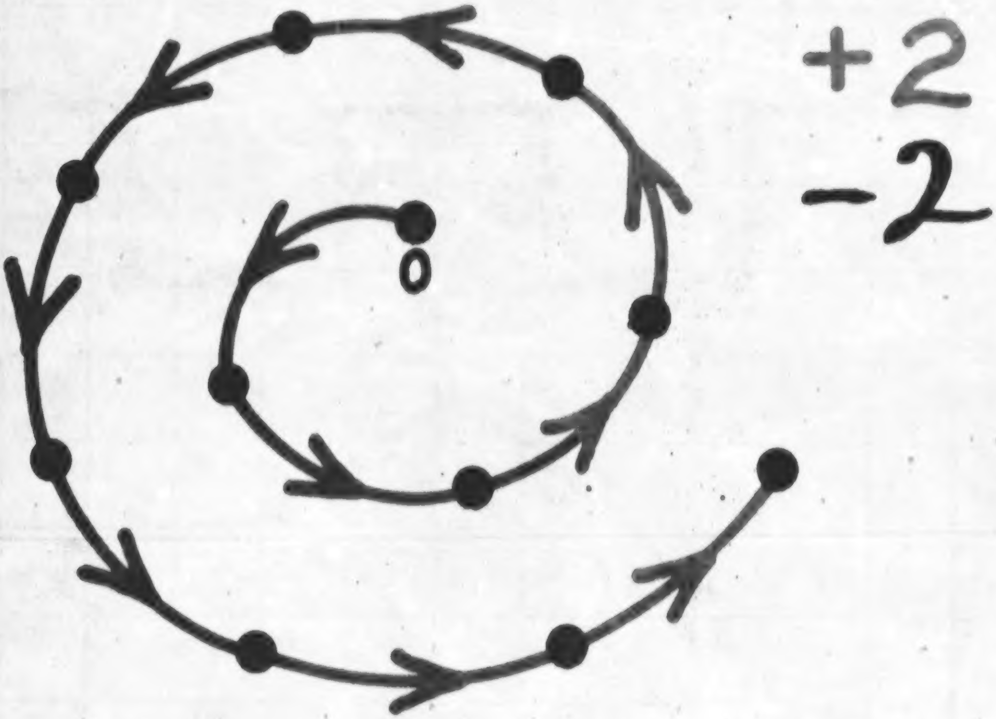



L
T

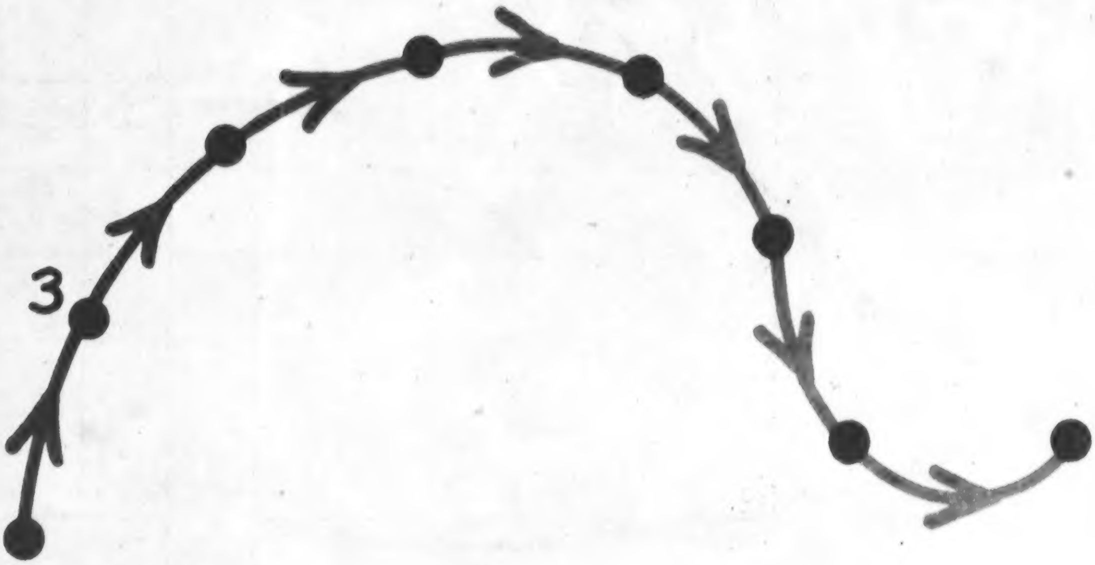
Name ________________________________

F 77

Label the dots.



+2
-2



F 77

Label the dots.